THE GEOGRAPHICAL REVIEW

PUBLISHED BY

THE AMERICAN GEOGRAPHICAL SOCIETY
OF NEW YORK

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1918

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VOL. V FEBRUARY, 1918 NO. 2

THE ESKIMOS OF NORTHERN ALASKA: A STUDY IN THE EFFECT OF CIVILIZATION

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The changes produced in the life and habits of the Eskimos of Northern Alaska during the last thirty-five years afford an interesting example of the effect European civilization may have upon an uncivilized and unprogressive people. By European I mean also American, since it was the United States and Canada, and practically they alone, which influenced and are influencing this region. That these Eskimos were incapable of developing internally to any marked degree is fairly evident from the fact that during all the centuries that have elapsed since their separation from the other branches of their race no fundamental change has taken place in either their social or their mental life. In fact, the environmental conditions to which they were subjected were unfavorable to any great development. Year by year the seasons returned unchangingly, each with its different pursuit, but all alike periods of strenuous quest for food. Spring brought the birds, the fish, and the whales; summer the trading voyages to east and south, followed by the caribou hunting and the fishing of late summer and autumn; while winter completed the circuit with its sealing through the ice. Whaling, fishing, and caribou hunting necessarily precluded much contact with neighboring peoples, while the trading in summer and the visits for dancing and festival in winter were all too brief to produce any radical change in their manner of life, even if their neighbors had been materially different. But the people who lived along the coast to the south and east were the same as themselves, while they rarely penetrated far enough into the interior in those days to come into contact with the Indians, with whom, moreover, they were usually on hostile terms. The use of fish nets and pottery, the custom of wearing labrets, and that of smoking are almost all that we can ascribe to outside influence. The great world beyond was too remote ever to reach or affect them, and their own

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life involved too arduous a struggle for existence to allow them that leisure which alone enables a people to develop.

Present Dependence upon Outside Civilization

With the advent of Europeans all this changed. The explorers of the middle of the nineteenth century remained for too brief a time and held themselves too much aloof to exert more than a temporary influence. The replacement of stone and copper utensils by iron was the main change this contact produced. The advent of the whalers about 1880 turned the scale. They mingled freely with the natives; formed temporary unions with their women; prosecuted an extensive trade with them for whalebone, caribou

Fig. 1—Sketch map showing the habitat of the Eskimos of Northern Alaska. Scale, 1:15,500,000.

meat, and skins; and used their services on and around the ships. Some of the seamen even deserted their ships and adopted the life and habits of the Eskimos. Firearms were introduced, and European food, notably flour, sugar, and tea, became first a luxury, then a necessity. The years from 1880 to 1890 saw the zenith of the whaling industry, when whalebone brought its highest price in European and American markets. With its decline a demand for polar bear and fox skins arose, and the attention of the natives was directed to the more permanent and profitable pursuit of trapping. This pursuit has endured to the present day and seems likely to continue indefinitely.

Firearms quickly produced a revolution in the economic situation. The caribou, never very numerous west of the Colville River, were exterminated or driven east. But few now find shelter in the winding valleys and lakes of the Colville basin and in the Endicott Mountains which separate it from the basin of the Mackenzie. Mountain sheep have always had a rather limited range and are now becoming rare even in their principal habitat, the Endicotts. Consequently, the fur necessary for winter clothing had to be brought in from outside, and the Eskimos west of the Colville ceased to be

self-supporting. At the same time a great impetus was given to the hunting of ducks, geese, and loons, and to the shooting of seals, as they basked on top of the ice in the warm days of spring or protruded their heads out of the water in summer and autumn. Winter sealing, with all its attendant exposure and hardships, gradually fell into decay, and the season was devoted to trapping foxes. European food, purchased in summer with fox skins, a few birds, and frozen fish stored away in the autumn have now practically superseded seal meat for the winter diet; while the whales killed in the spring supply not only much of the blubber but also the "black skin," or *maktak*, which has always been regarded as a delicacy. The blubber lamp has given place to the lantern and kerosene for light and to the iron stove and "Primus" lamp for cooking, though at Barrow, where the wood supply has been exhausted, whale blubber is burnt for fuel in iron stoves. At least half of the food consumed by the Eskimos of Northern Alaska now comes from European sources.

The winter house, on the other hand, though slightly modified by the introduction of iron stoves, has changed but little from its original form. From the first thaw in May, however, till the freeze-up again in September it is uninhabitable, for the melting of the winter coat of snow floods the interior with water. Formerly the Eskimos moved in spring into tents of caribou skin, which they carried in their umiaks along the coast and up the rivers, and packed on their backs overland during the caribou hunting of summer. Now they everywhere use tents of cloth, which are both cheaper to make or buy and lighter to carry. Some, indeed, at the beginning of winter surround their tents with snow walls instead of building or reoccupying their huts of wood. At Barrow a few cottages have been built on a European model, with board floors raised slightly above the level of the ground. They too are lined with snow walls in winter, which are removed at the first sign of warm weather in spring, and are thus habitable the whole year round.

Reindeer

Life's three great necessities, therefore, food, shelter, and clothing, the Eskimo is no longer able to provide for himself. Remove the supply from without and he will perish within a few years. The United States government has indeed attempted to restore their independence by introducing herds of Lapland reindeer at Barrow, Point Hope, and other places farther south; but the project can hardly be considered to have passed much beyond the experimental stage, at least in the north. The Eskimo there has always been a hunter and finds it very difficult to accommodate himself to the pastoral life of the Lapp, however profitable it may be. Whether the breeding and tending of the reindeer will ever become popular and universal among them still remains doubtful, though amongst the natives farther south it has already become one of the most important economic factors in

FIG. 2—Camp of inland Eskimos (Nunatagmiut) at Collinson Point, May, 1915.

their life. But reindeer have not been established east of Barrow, and perhaps never will be. Nothing in that region indicates that the life of trapping and hunting will ever be changed.

Changes in Material Culture

It follows as a natural result that their material culture in all its details has undergone great change. The old weapons of the chase are fast disappearing. Stone immediately gave place to iron, the bow and arrow soon vanished, and the harpoons and spears used for sealing and whaling are fast following in their wake. The three-pronged bird spear with its thrower (the musk-rat spear of the Mackenzie, the fish-spear of the Copper Eskimos) and the bird bolas are now very rare. Even kayaks are far less common than formerly, and the skin umiak is being supplanted by the whaleboat. The sled introduced by the whites replaced at once the old type with mud runners, and the harness, though still widely used in its old form, is generally made of leather or canvas instead of deerskin, while the trace is invariably of rope; as for the dogs they are now driven single file or in pairs, not abreast. European tools, axes, saws, knives, files, scissors, etc., are found in every household. Of their old implements only five are in everyday use, the snow shovel, the bow drill, the curved whittling knife, the woman's knife, and the skin scrapers, all of which, save perhaps the bow drill, are more adapted to the purposes to which they are applied than any implement which we can supply. It is interesting to note that while the implement used for stretching and softening skins is generally an iron ferrule set on a short wooden handle, the actual scraper, which is set on a similar handle, is still commonly made of flint. The scraper, its flaker of copper, and the snow shovel—these alone have preserved the original type unchanged. Many natives possess sewing machines, for calico overclothes are held to be as necessary as fur underclothes. Woolen hose, woolen shirts and vests, even felt and leather boots are daily growing in use. The old-fashioned frock coat has been superseded by a plainly cut style which shows no variation from Nome to the Mackenzie. Labrets are worn by but one or two old men, and the curious willow-stem pipes, modeled perhaps on an Asiatic pattern, cannot withstand the invasion of the briar and the cherry. Very little in the outward culture now differentiates the Eskimo from the white.

Changes in Population

Equally great has been the change in the density and distribution of the population. The coast from Barrow to Demarcation Point was once the home of a thriving people, as is attested by the numerous ruins of settlements on the Thetis Islands, at Collinson Point, Barter Island, and elsewhere. But almost all these Eskimos, for some reason which is not at present known, had disappeared before the arrival of the whites. Dease and

Simpson, when they voyaged along the coast in 1837, and Collinson, when he wintered in Camden Bay in 1852, saw but few remnants of them. Barrow and Point Barrow alone seem at first sight to have kept up to their ancient level; but they too have declined, for, as Stefansson has already pointed out, but few of the existing inhabitants are descendants of the former population; the great majority are immigrants from elsewhere, from the interior and from the coast settlements to the south. Diseases, especially measles, tuberculosis, and venereal diseases, followed in the train of the whalers; fostered by a lax morality and by a total igorance of the laws of hygiene, they swept through the helpless population like a devastating plague. Today their ravages are less apparent—the first invasion of a new disease is always the most fatal—but they have left their traces everywhere. The last two diseases are still common, and the descendants of the old coast population, who were naturally the most affected, seem to have lost some of their virility; at all events it is noticeable that almost all the whaleboats at Barrow and Point Barrow, together with the scows at the mouth of the Mackenzie, are owned by natives from inland. They migrated from their homes, the Eskimos of the Colville and westward going for the most part to Barrow and Point Barrow, those eastward of that river to the Mackenzie. In the winter of 1913-14 only one family was said to be living in the Colville basin, and not more than three or four pass the summer there. Yet thirty years ago a considerable population fished up and down its rivers and speared and netted caribou on its hills and lakes. Natives from Barrow and Point Barrow spread eastward in winter as far as Harrison Bay for the purpose of trapping foxes; in spring and summer this part of the coast is deserted. Between that point and Flaxman Island there are no inhabitants. In 1913 and 1914 six families resided, winter and summer, between Flaxman Island and the boundary, but all of these were newcomers—two from the Colville, one from Point Hope, and one from Port Clarence. Some dozen families belonging to the old inland people still winter on the south slopes of the Endicott Mountains within the tree line, trapping and caribou hunting. In spring, during the bird and sealing season, they come down to the coast and trade with their fellow-countrymen and with an occasional white man; in autumn they retire over the mountains again. This is all that remains of a once dense population, dense, that is, for a people that gained its living by the chase.

Social and Family Life

Generally, but not always, the social organization of a hunting people is very simple, and the Eskimos were no exception. They lived in groups of families which clustered together in winter at the sealing and whaling grounds and scattered inland in summer for the caribou hunting. The families were connected by ties of kinship and relationship, and the communion and intercourse between them was consequently closer than in the

more heterogeneous villages of the civilized world. There was no division into rich and poor, for the products of the chase were shared by all. Some were naturally better hunters, more skilled in magic, or possessed more force of character, and so enjoyed greater influence than their fellows; but in theory all were equal. Characteristic of the winter life was the dance house, where the people diverted themselves and entertained their visitors. At odd times it formed a sort of clubhouse and common workshop for the men and a playroom for the children. Barrow annually exchanged visits for trade and dancing with Wainwright Inlet. The migratory life of summer naturally excluded the dance house. At that season they wandered over the land in small bands, each comprising three or four families who combined for caribou drives very similar to those which still take place among the Copper Eskimos to the east. Organized war was unknown; whatever hostility took place was sporadic and unpremeditated. Within the community the great guardian of the social rules and customs was public opinion. Murder provoked the blood feud, and a flagrant wrongdoer might be suddenly attacked and killed by his neighbors with the approval of the community at large.

The home life seems to have been peaceable and well-conducted. The aged were treated with respect, the young with indulgence. It is doubtful whether these Eskimos ever regularly deserted the old and infirm when their strength gave way; present-day natives deny the charge. Nor has infanticide been proved against them, though the practice of isolating mother and babe for months, often provided with the poorest shelter against the winter cold, must have caused great mortality. Adoption was frequent, the adopted child receiving the status and treatment of the real. Chastisement of children was rare, though it did occur, and harsh conduct brought condemnation and ill will from kinsmen and neighbors. The Eskimo carried into his home the patience and endurance instilled into him by his whole manner of life, by the weary watching over the seal hole in winter, the tedious fishing of spring, and the waiting behind cover during the caribou drives of summer.

The change in the economic environment has naturally reacted upon all this. In winter the families scatter by twos and threes for trapping. Frequently two families, generally but not necessarily connected by kinship, occupy a single hut. Sometimes they divide it by a partition wall, leaving a blank space at one end of it to serve as a passage between the two rooms. The dance house has vanished; such dances as occur at Barrow and Point Barrow, the only places where there are any great assemblages of people, are held in ordinary private houses. In spring the families reassemble for sealing and whaling, but they are more or less unsettled throughout the summer and autumn. The influx of natives from other places has relaxed the old intimate relations that prevailed amongst them, though open house is still kept everywhere and friends and strangers alike are hospitably enter-

FIG. 3.

FIG. 4.

FIG. 3—Man in kayak drawing fish out of a net. Canadian Arctic Expedition's schooners *Alaska* and *North Star* in the offing. Shingle Point, Mackenzie River delta, August, 1914.

FIG. 4—Aiyakak digging in the ruin of an Eskimo house. Western sandspit of Barter Island, July, 1914.

FIG. 5.

FIG. 6.

FIG. 5—Inland Eskimos reaching Collinson Point in May, 1914 after spending the winter trapping south of the Endicott Mountains, Northern Alaska.

FIG. 6—Fox skins drying. Humphrey Point, Northern Alaska, May, 1914.

tained. Trade is producing a growing differentiation in the matter of wealth, but there is no distinction of class and no real poverty, for the needy are supported by their more prosperous neighbors. The administration of justice has passed into the hands of the United States government, and in consequence the blood feud has disappeared. So, too, have other old customs, sorcery and magic of every kind (at least on the surface), and the isolation of women in childbirth. Sexual morality has greatly improved, partly from a growing knowledge of the evils to which loose living gave rise, partly as a result of missionary teaching. Much progress must still be made, however, before the standard of civilization is attained.

Readjustment of the Social System

Stefansson recommended, on the ground of humanity, that the Copper Eskimos should be allowed to live their life undisturbed by any intrusion from outside. This is no longer possible, since the world has learned of their existence, apart from the fact that they themselves are now beginning to make annual visits to Great Bear Lake, where they meet with both Indians and whites. Nor does it seem justified by what has happened in Northern Alaska.

Speaking generally, when a savage or uncivilized race is first brought into contact with civilization, two results usually occur. First the old social system breaks down, carrying with it the morality that it supported. This opens the road to self-indulgence and excess of every kind, followed by disease and misery, which, partly directly, partly indirectly, by undermining the virility of the race, cause its decline and sometimes its extinction. This is what occurred, for example, in Tahiti, and amongst some of the American Indians. Sometimes, under counteracting influences, the people recover, as in Samoa, and such recovery seems to be going on in Northern Alaska. There the very simplicity of the social organization and its adaptability to new conditions prevented its destruction; it altered without entirely breaking down. It still lends its support to the respect with which property and persons are regarded and binds the people together in harmony and good-will. Injustice and theft, spite and malice occur the world over but are not more common in Northern Alaska than elsewhere; probably they are less common, since the hardships and vicissitudes of Arctic life render it necessary for every man to be ready and willing at all times to help his neighbor; another day he may himself stand in need of assistance. The one virtue which the Eskimo of Northern Alaska lacks is cleanliness. Yet even in this he has made a great stride forward, as may be realized when one compares him with the Copper Eskimos. It must not be forgotten that for eight months in the year every drop of water that he uses, whether for drinking, cooking, or washing, he obtains only by melting snow or ice within the house, in a small pot upon a tiny, often homemade, stove; and further that the fur clothing he wears, the only kind of clothing that is

adapted to the rigorous climate, must be kept dry at any cost and so cannot be maintained spotlessly clean like the woolen and cotton garments of civilization. He may be forgiven, then, if he fails to attain our standard of personal cleanliness. Undoubtedly he will continue to improve in this respect as time goes on; at present it is ignorance rather than carelessness that keeps him back. We cannot attribute to bad hygiene alone the spread of disease and consequent heavy mortality of the past. Even under the best conditions a new disease will travel far and wide. Moreover, there are strong grounds for believing that these Eskimos were declining in number

FIG. 7—Tents of two Eskimo families (Aiyakak's and Teriglu's) near Barter Island, May, 1914.

even before the whites appeared; it is difficult otherwise to account for the extent and number of the ruined settlements that dot the coast line. The same slow process of decline seems to be going on today among the Copper Eskimos, though the cause remains obscure.

MISSIONARY INFLUENCE

Missionary teaching, however imperfectly understood, and however misinterpreted, has been on the whole beneficial to the Eskimos. A native no more than the average white man can reason out a set of moral rules to guide his conduct. He depends on custom to tell him what to do and what not to do, and custom unfortunately prescribes or allows many undesirable practices. I once remonstrated with some Copper Eskimos about the wanton killing of caribou when not absolutely required for food or clothing. They merely replied, "Oh, but that is our custom," and considered the matter ended there. So, too, in Northern Alaska, custom prescribed all kinds of magical ceremonies in connection with hunting, sometimes accompanied by the grossest immorality. When the old customs were thrown overboard with the coming of the whites, missionary teaching stepped in and with its peremptory commands of "thou shalt" and "thou shalt not" upheld the better elements in their moral code, while unconditionally condemning the bad. The Eskimos grasped immediately at the externals of the religion offered him, the praying and the singing that so much resembled his old incanta-

tions, and the resting on Sunday. It would be hard to find a family in the whole length and breadth of Northern Alaska that is altogether indifferent to these things. Yet it is wrong to affirm therefore that the total result of missionary teaching has been simply to introduce new ceremonies, new incantations, and new taboos in place of the old. Such a view overlooks the strong influence exerted toward a higher morality and a more intellectual life. Man's thoughts and actions are not revolutionized in a day; the wise teacher looks to the future for his results, to the generations that come after him. So if the Christianity of the Eskimo today is very crude and full of superstition, it is nevertheless free from many of the injurious practices of his old religion and contains in itself the germs of a higher development.

Trapping as an Economic Readjustment

The second result of contact with civilization is the change it produces in economic conditions. The native, unable to adapt himself to the altered circumstances and take up a new mode of life, loses all his energy and pines away in idleness and melancholy. To this more than to any other cause must be attributed the total extinction of so many uncivilized peoples during the last four centuries. Protective legislation and the fostering care of a paternal government can delay but not arrest its action. There is but one remedy, to find some new field of enterprise that will be congenial to the natives and absorb all their energies. Such to the Eskimos is trapping. It requires almost the same exertions out of doors in the winter twilight as did sealing through the ice in former days, while their old love of the chase still finds its outlet in the caribou and mountain-sheep hunting in the Colville valley and the Endicott Mountains, in the whaling round Barrow, and in the shooting of birds and seals all along the coast. Conditions have changed, but not so much as to make the Eskimos lose their grasp of things, and the new mode of life, if it involves less hardship than the old, is not so easy as to sap their energies and destroy their virility.

Education

Education is slowly spreading among the younger generation. English is taught in the school at Barrow and by the missionaries in the Mackenzie Delta, while the natives pick up a little from the traders. Only two or three indeed could write even the shortest letter in English; but notes in their own language, in the simple script of the missionaries, are freely current all along the coast. The Eskimo may have been a savage in many of his customs, but in intelligence he ranks far above the average. The Northern Alaskan natives did not adorn their implements with representations of the chase to the same extent as their kinsmen in Greenland, yet they possess no mean artistic skill. Young and old alike can make presentable drawings of men and animals, of hunting scenes, and of domestic life. A Colville River Eskimo who had never handled a pencil before made a very tolerable sketch of the Colville River and its tributaries. They have always been skilful in

the use of tools and in consequence make admirable craftsmen. Many take their watches to pieces and put them together again. Talents such as these are likely to be especially useful in a people on the very outskirts of civilization.

Future Prospects

The exact number of the half-caste population is uncertain. Undoubtedly it is very small as yet, but it will probably increase as time goes on, for

Fig. 8—The Klengenberg family, Baillie Island. The father was of Danish extraction, the mother an Eskimo woman from Cape Prince of Wales.

the Eskimos have no objection to intermarriage. The mixed race must of necessity follow the same manner of life as the natives. At the same time it should prove a strong factor in the progress and development of the country from the greater interest it is likely to have in the outside world. Even now some of the Eskimos are beginning to trade directly with the United States, sending their furs through the post office at Barrow. There is every reason, then, to believe that these Northern Alaskan natives will escape the fate of so many uncivilized peoples of the present day; they will survive, like their brethren in Greenland, as a factor of no large importance, yet not altogether unproductive, in the world's life. Civilization, if it brought ruin and destruction at its first invasion, remains to build, and the new edifice promises to be fairer and worthier than the old.

THE ISOLATION OF THE LOWER ST. LAWRENCE VALLEY*

By RODERICK PEATTIE

In the Lower St. Lawrence Valley is established a civilization unique in its lack of progressiveness and picturesque in its proud adherence to the ancient customs of ancestral founders. The wooded mountains shadowing the valley, the steep cliffs which rise, at places, straight up from the river bank, the comparative inaccessibility of stretches of lowland available for agriculture, the scarcity of good harbors from the Gulf to Quebec—all are natural factors which have combined to isolate the inhabitants from the rest of the world and even to a surprising degree from one another.

Here, on strips of land or in little towns by the shore, the French Canadian engages in primitive but thrifty husbandry. Modern education has penetrated the region but slightly. The people have preserved the traditions brought overseas from France and have developed a provincialism which has recognized throughout the years no law of conqueror and no control save that of the Catholic Church and which is at present serenely withstanding the censure of more belligerent peoples.

The Physical Conditions of Isolation

The Lower St. Lawrence Valley may be thought of as extending from the Isle d'Orléans, just below Quebec, to the relative restriction of the river between Cap des Monts on the north shore and Cap Chat on the south shore (map, Fig. 1). In the three hundred miles of its length the estuary widens from two to forty miles, which is a prominent factor in giving each shore certain physical and economic distinctions.

The North Shore

The north shore is characterized by a bold escarpment 1,500 to 2,000 feet in height, the crest of which is the southern boundary of the great Laurentian upland. Set back perhaps a mile from the edge of the escarpment are low, rounded mountains, the Laurentides, rising 500 to 1,500 feet above the upland. The upland itself dips gently northward; its undulating, tree-covered surface extends mile upon mile with amazing lack of striking forms of relief.

There are few settlements upon the upland. For the most part, forested wilderness comes unbroken to the escarpment, and in places the trees crowd down the steep slope to the water's very edge. Some of the community

* This paper is the result of a library investigation, followed by studies in the field during the summer of 1916, carried out by the writer under the direction of the Department of Geography at Harvard University. These studies included a 900-mile trip along both shores of the estuary—300 miles on foot and the rest by train, wagon, steamer, row boat, and butcher cart.

groups so infrequently scattered over this country of rugged solitude lie at the mouths of tributary stream valleys, others on terraces that lie at the base of the cliff. Wedge-shaped rift valleys penetrating the highlands offer sites for farming communities, and even the margin of the highland boasts settlements. Generally the upland has too meager a soil for agriculture, but where the Laurentides have stood as a protection against more severe glacial erosion the soil is deep. The coastal terraces, particularly the lowest, are of primary importance as settlement sites. These terraces are mantled with rich marine soils.

The South Shore

Bounding the south shore is another highland. From elevations of 1,000 feet opposite Quebec, it grows into mountains 3,000 feet in height as it nears the Gaspé Peninsula. Like that on the north, this upland is a rolling, infertile woodland plain, farmed only at the edge for the most part; but instead of terminating in a cliff, it descends gradually to the lowland. Although it lies 30 miles inland at the western end of the valley it approaches the river 100 miles down stream. From that point it follows the shore more closely, in most places grading down to the level of the water by a series of broad terraces.

These terraces are fertile, though for various reasons not always well drained. The lowest, as is the case on the north shore, is of recent emerged estuarine silt. The soil of the lower terraces, and in the western end of the valley of all the terraces, is marine and very productive.

Climate

The climate is of an extreme continental character on a leeward coast in a belt of prevailing westerlies. Herbertson has called it the Laurentian type and compares it with the similar climate of the Amur district. There are within the region two slightly different types. The seaward portion has an appreciable marine influence, to which is added the effect of an increase in latitude by the northeast trend of the river. Generally speaking the winter is long and cold and the summer is short and warm. The precipitation is not heavy.[1] The result is a natural vegetation of the northern conifer type, principally of spruce, fir, and pine. Hardwoods are also abundant. The snow lies on the ground until May, but once it is melted the spring blooms suddenly. The growing season has a maximum of 150 days and is usually considerably less, but the summer day is long and the rainfall not too heavy, so that grains will mature. Maize is not grown, and the frost-free period is too short for the larger fruits in the greater part of the area. The heavy snow, averaging 120 inches in depth, supplies a roadbed

[1] The mean annual temperature range is 60° F. in the southern division, but in the north this is reduced by 10°. The mean monthly temperatures of Quebec are: January, 9.4° F.; July, 65.5° F.: for Anticosti Island (Southwest Point), January, 12° F.: August, 57° F. Precipitation is 40 inches at Quebec and 35 at Father Point, about 70 per cent of this being in rain.

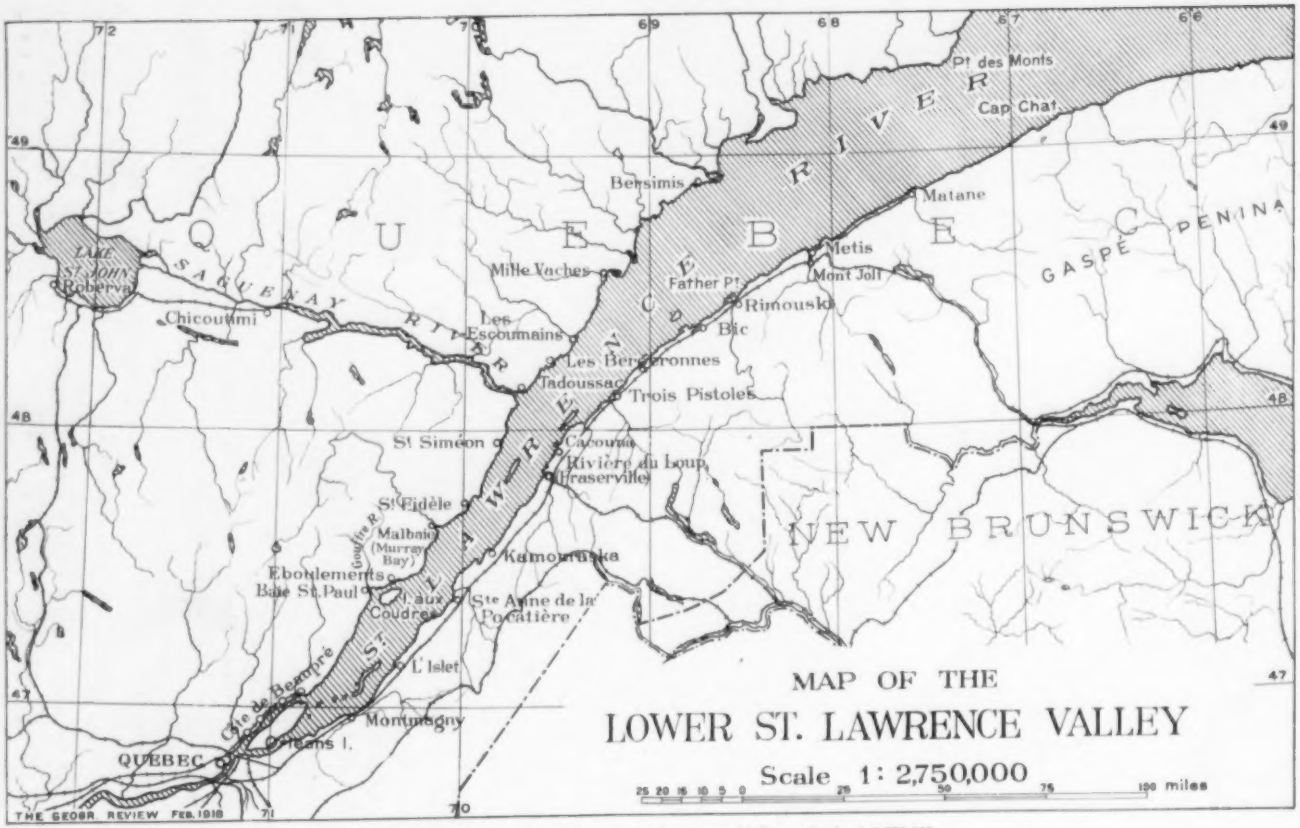

FIG. 1—Sketch map of the Lower St. Lawrence Valley. Scale, 1:2,750,000.

for logging in winter and water for the spring "runs." For five months of the year Quebec is a closed port, and the river is dangerous for at least one month more.

Economic Responses

Such are the physical conditions of the valley. A few of the economic responses which result from these will now be described. The region has terraces and lowlands in which life never has been meager. Wood products and, recently, farm products have furnished the foundation for a healthy commerce. But the primitive economy of the hinterlands on each flank, the imperfect communication, and the lack of doorways by which one may enter the territory have been formidable barriers to cultural exchange.

Economic Conditions of the North Shore

The farm products of the north shore are grains, hay, vegetables, and tobacco for home consumption. The one "money crop" is cheese—a recent development. This statement does not apply to the Côte de Beaupré, where milk, butter, and vegetables are furnished to the Quebec market. No village or hamlet is without the log-products industry. There are extensive lumber, pulp-wood, and pulp mills on the larger streams, and no settlement is too small to support some industry dependent upon the forest and the water power. It may but be a small water-run mill for crude lumber or a commerce in cord wood.

The water power is furnished by every stream in greater or less degree as it tumbles down from the upland. The Côte de Beaupré alone is served by a railroad. Beyond, the uplands come to the river's edge and present a cliff 1,500 feet high for 30 miles. At the base of this cliff a railroad bed has been blasted as far as Malbaie and will be continued to the Saguenay. The other communities are now reached for the most part by boat. As far as the Saguenay the boat service from Quebec is regular through the summer months.

There is no farming and but one large stream between St. Siméon and Les Bergeronnes; hence there are no settlements except Tadoussac, which is a resort and the point of transfer for the Saguenay River. From Les Bergeronnes to Mille Vaches there are streams which bring down timber and furnish power for its reduction. The climate and the peaty variety of much of the soil make farming a precarious pursuit. Beyond Mille Vaches there are no roads and scarcely a farm. In the remaining 100 miles there are half a dozen settlements deserving the name of town, and these are supported largely by fishing.

Economic Conditions of the South Shore

The south shore has much rich lowland, and, moreover, it is continuous, so that there is good rail communication. It is primarily a farming district, though in the aggregate the industries are not unimportant. The climate is

FIG. 2—Typical view of farmlands on the Lower St. Lawrence. Note the fence lines extending back to the ridge in the background. The all-importance of the St. Lawrence as the common highway made frontage on the river essential and led to the division of land into strips "measuring their width by the foot and their depth by the mile." (All photos. except Figs. 3, 7, and 8, by the author.)

somewhat milder than on the north shore, and, owing to the favorable topography and the good land communication, the farmer may consider himself possessed of advantages over his fellows upon the other side of the river. The Intercolonial Railway parallels the coast from Quebec to Mont Joli, and a small line continues to Matane. Butter, cheese, and live stock are sold according as the distance from Quebec becomes greater. Vegetables, particularly potatoes, and eelgrass (*Zostera marina*), for upholstering automobile seats, are other "money getters." The region has a fine active commerce through Quebec, but cultural contact in other directions is practically nil.

The industry upon the south shore is not extensive enough to do more than mitigate the isolation. The farming centers are small towns from ten to twenty miles apart. None of these are large even when they contain factories. The industry is usually some form of woodworking such as the production of lumber, pulp wood, furniture, or wagons. The larger mills are located at Ste. Anne de la Pocatière, St. Pâcome, Rivière du Loup, Bic, Tobin, Rimouski, Priceville, and Matane. Generally speaking, the greater the distance from Quebec, the less finished is the article produced.

Poor Water Communication

Strangely enough, though the Lower St. Lawrence is one of the great commercial estuaries of the world, the region has, as a whole, poor or imperfect water communication. The reasons are these: First, there is the significant climatic fact, already mentioned, that Quebec is a closed port five months in the year and a dangerous one for at least another month. Second, the region lacks good harbors, especially upon the south shore. The coast is much indented, but the present physiographic condition of the estuary is one of emergence of a confined delta, so that the approach to the shore is always shallow. Father Point, near Rimouski, and Rivière du Loup form partial exceptions to this condition, but much of the huge output of lumber from Matane is taken out to ships by means of lighters, and Rimouski sends its lumber out over a harbor that at low tide is dry for two miles from the shore. The north shore with the exception of Tadoussac has no natural harbors for large craft. The boats land at piers which are not always near the town and are frequently useless at low tide. Baie St. Paul and Murray Bay are huge indentations guarded by rugged capes, but the recent uplift and the constant filling by streams has created tidal flats of from one to three miles over which only the smaller type of schooner can float at high tide (Fig. 9). The distance from the farming centers to the docks, and the irregularity and inconvenience of the boat service, are discouraging features of communication. Beyond the Côte de Beaupré the bulk of the freight can be moved only in summer, for in winter the only communication is by small ferries that run across to the south shore. Because of these difficulties the north shore still preserves a large measure of independence.

Recent Modification of Isolation

Ten years ago isolation was almost complete. Since then there have arisen ameliorating factors. The simultaneous development of transportation facilities and of the cheese industry brought buying power to regions which a few years before were compelled to provide for themselves everything in the way of food and clothing and all building materials save hardware. Even today the food is nearly all of home production; linens and woolens are spun in the cottages; tools as likely as not are homemade; and ideals are surprisingly local. This independence never existed in the region beyond Mille Vaches. Fishing communities have always been commercial, but distance, combined with seasonal isolation, can affect remote settlement to a degree almost incredible to those accustomed to the social and commercial exchange of more populous districts and a more amenable climate. There is much undeveloped water power in this region, but under present conditions it is not profitable, apparently, to go so far from the centers of population as western Quebec and the Maritime Provinces for power, particularly as the region is limited in its resources.

Another factor may be mentioned here. It is the culture brought in by the numerous visitors to the fashionable resorts of Murray Bay and Tadoussac, and the more modest ones of Métis, Kamouraska, and Cacouna, as well as that contributed by the sportsmen who haunt the forests throughout the region. But this influence is more than offset by the strictly French and Roman Catholic character of the population. Indeed, the region is likely to prove uncongenial to the immigrant or visitor who lacks a knowledge of the French tongue and a devotion to the Catholic faith.[2]

Historical Evidences of Isolation[3]

The conditions of isolation which have been summarized in the foregoing have made themselves felt in the human history of the region from the first, and it remains only to point out these elements in its history and to give a few present-day evidences of its remarkable provincialism.

Meager Commerce of New France

Colonial stability is based upon a commerce with the mother country. In a large measure this commerce depends upon the natural resources of the region, but in a lesser degree the economic condition of the mother country and the difficulties of intercommunication play a part. In the fifteenth and sixteenth centuries, New France had but one product upon which to base her commerce, namely, fur. A variety of commercial experiments failed. Agriculture labored under disadvantages, and it was long

[2] E. C. Semple: The Influence of Geographic Environment on the Lower St. Lawrence, *Bull. Amer. Geogr. Soc.*, Vol. 36, 1904, pp. 449-466. Substantially the same paper is published under the title "The North-Shore Villages of the Lower St. Lawrence" in "Ratzel Gedenkschrift," Seele & Co., Leipzig, 1904, pp. 351-360.

[3] The authorities from which has come the mass of the historical material are G. M. Grant, Francis Parkman, E. C. Semple, Benjamin Suite, R. W. Thwaites, F. J. Turner, Justin Winsor.

before the demand for food within the settlement was supplied by home produce. The greatest obstacle to husbandry was one peculiar to these settlements, in contrast with the English colonies. This was the shortness of the growing season, an adverse condition which the sixteenth century was ill equipped to contend with, for it was ignorant of our science of plant selection. The fact that a crop was of the first importance to the human beings who desired it did not keep it from failing. The country was not adapted to the growth of certain of the most nourishing products. Maize, for example, which was so great a blessing to the English colonies, could not be raised in New France.

But yet another factor, equally vital to industrial development, was lacking. This was industry of the sort that perseveres under all the discouragements of monotonous toil. Fur trading was an easy road to wealth, and this, together with the pleasures of hunting and fishing, encouraged indolence in the settler. He was content to be fed from the ships that came for furs. Thus the colony endangered its relations with France by being a constant drain upon her, by offering a single article in commercial exchange, and by having little or no economic independence. The difficulties of communication in those days of small boats need not be emphasized. A sailor might be held in inaction for several months awaiting favorable winds to take him across the ocean. One case is recorded where the New World was actually sighted by the eager sailors, when a storm arose which blew the helpless ship all the way back to France. Even with favorable winds the journey was long and perilous. Quebec, the one important port of the region, was, moreover, closed for five or six months of the year.

Thus the centrifugal force which tends to break a colony from its parent country was great in the Lower St. Lawrence. The centripetal tendency, commerce, was weak. Once the colony began to feed itself, the feeble commercial intercourse and the difficulties of traversing the long distance tended to give to the valley an independence of and lack of connection with France. This isolation was made the more complete by the vast wilderness which separated New France from the other American communities. The characteristics which were the inheritance of these settlers, their customs and modes of living, solidified. The men and women of New France drew upon tradition for their ideas and ideals and remained almost untouched by those influences from outside culture which incite to progress.

Isolating Factors at Time of Settlement

These powerful factors isolated New France, or the whole of Lower Canada; but there are physical characteristics peculiar to the Lower St. Lawrence Valley which have been and still are potent in isolating small groups and even individuals.

The river itself was not the least of these. It was the primitive highway, and in the earlier days of settlement each man thought it essential that his

FIG. 3.

FIG. 4.

FIG. 3—The Côte de Beaupré along the north shore below Quebec, at Ste. Anne de Beaupré. Isle d'Orléans forms the opposite shore. Causeways lead from the main highway across the meadows to landing places, which occur at frequent intervals. (Photo by Isaiah Bowman.)

FIG. 4—The Beaupré highway at the foot of the lowest coastal terrace. The nearness of the houses is due to the narrow river-frontage of the farms (see legend of Fig. 2). Note the plastered houses, the bird cages at the eaves, the thatched barn, and the hewn-log construction.

FIG. 5.

FIG. 6.

FIG. 5—A farm group in the Gouffre valley on the north shore. The Norman architecture of the house in the background is an interesting survival from the mother country. The light-colored straw on the ridges of the thatched barns was put on as late as the summer of 1916. To the left of the barn is an oven house. The crop in the enclosure is tobacco.

FIG. 6—A former manor house, Baie St. Paul. Norman architecture.

farm should have a frontage upon the river. Not only was the river the highway, but it provided fishing opportunities as well. Moreover, the majestic stream deeply affected the minds of these imaginative settlers. It was the connecting link between the clearing and the little trading post; it gave the pioneer a sense of confidence and a courage to venture far in search of good land, while its friendly, open expanse mitigated the gloom of the trackless forests, the home of the savage and the wild beast.

FIG. 7—A boat with lumber on the Saguenay River. Note the precipitous character of the cliffs in the background. (Photo by Isaiah Bowman.)

To show how prodigal the people were of territory, the parish of one of the early Jesuit priests, Père Morel, included the 27 leagues from Rivière du Sud to Rivière du Loup and contained but 326 souls. Louis XIV attempted the establishment of three compact villages near Quebec and gave the people land and houses to occupy; but the river called, the people deserted the villages and returned to their former homes along its bank (Fig. 4). Nor were the settlements continuous even there. Topography and soil were the controlling factors in the location of the earlier settlements; and, as has been shown in the first part of this article, topography and soil were not always favorable. The sterility of the uplands and their inaccessibility from the river, especially upon the north shore, the morasses of the south, the meager distribution of the lowland upon the north—all hindered free communication and rendered isolation effective. Nor can we regard the St. Lawrence as a river merely. To the paddler of a canoe this estuary was rather an inland sea than a river. So far apart were the shores that men on opposite banks might well regard each other as foreigners.

These elements of isolation meant a weak defensive against Indians and English. Had the Champlain-Richelieu depression met the St. Lawrence at a point east of Quebec, the marauding parties of the Five Nations might have aroused in the settlers such fear of destruction that they would have concentrated in defensive groups, but these lower reaches were undisturbed by the tragedies of savage warfare, and the people felt little need for co-operation. Instead of the co-operative impulse, a strong independence,

the inevitable result of this scattering, was the outcome. The Crown observed this and issued royal decrees to bring the people nearer together and more directly within its jurisdiction; but these mandates were unheeded. The Church, in order to care for its flock, found it necessary to convert its priests into voyageurs who dared to venture upon long and lonely journeys by canoe, reaching parishioners in the remote wilderness. There was an advantage inherent in this dispersion, however, for while Trois Rivières and Quebec spent their nights in brawling and fighting, the cottages of Beaupré were scenes of pious domesticity. Today the Church still recognizes the moral value of rural quiet and so aids those patriot societies whose object is to prevent emigration and expatriation in keeping the French Canadian at home and upon the farm for the good of his soul.

Tolerant Policy of England

That this isolation has been a vital and active factor in shaping the character of the *habitant* we have been assured by historians and geographers, though few of them have described the physical conditions. The great historical proofs are these:

When Quebec fell before Wolfe and the English established themselves over Canada, the *habitant*, a prisoner within the narrow horizon allowed him by his physical environment, demonstrated his indifference to the change of these distant governments as completely as did the imperturbable flood of the St. Lawrence.

The policy of England toward this little nation is again instructive. By the Quebec Act, in 1774, the English allowed the French in Canada "the benefit and use of their own laws, usages, and customs." This meant their flag, their language, their treasured religion, and the parochial system of education. This policy on the part of Pitt was diplomatic to a degree. The disgruntled English colonies to the south were in 1774 already dangerously restive. England's failure to hold them was owing to the distance across which the authoritative arm had to reach and the distractions of successive European wars. Upon Lower Canada, too, this factor of distance would have exercised a powerful influence had she not possessed those natural elements of unity which make for independence. Add to this the geographical conditions, physical and economic, which prevented cultural invasions by the English from western Quebec, and it is easy to see that here was a people whom the English could not coerce into assimilation and who remained indifferent to the making of decrees.

Indifference to the French Revolution

While the soul of France was being bled, destroyed, and reborn by the Revolution, the *habitant* quietly tilled his land or pushed his canoe along the lonely streams, feeling only the tranquillity of the forests about him. The stirring principles of republicanism, individualism, and romanticism

which kindled France did not penetrate those backwoods and, what is more remarkable, excepting possibly the first they have not yet penetrated them.

In the present day of catastrophic history the French Canadians, justly or unjustly, are criticized for their lack of interest and participation in the struggle into which both their national mother and their national foster-mother have thrown themselves. So far as the charge is true, we can explain it in part by the fact that the Lower St. Lawrence Valley is an agricultural country of great economic independence, still holding a significant isolation from the rest of the world and, because its communities are scattered, lacking that cohesion necessary to enthusiasm, protest, and partisanship.

Present Evidences of Isolation

This prolonged isolation has produced a provincialism the strength and purity of which is unmatched upon this continent. According to Royce,[4] a province is a part of a national domain which is, geographically and socially, sufficiently unified to have a true community consciousness, a pride in its own ideals and customs, and a sense of distinction from the rest of the country. Here individuals are molded in a common pattern, and the pattern is provincial. The ultimate of such a provincialism may be an evolution of the inherited type, or, if the environment offers unfavorable conditions for development, it may be a crystallization of the inherited type. In what follows we are to note a few of the many and varied evidences which bear witness that our region is of the latter type. There are many to be found in print, and a sojourn in the region will offer to the inquiring visitor obvious proofs of this crystallization.

Language

The language of French Canada is its most striking feature.[5] It is a speech which has more semblance to the speech of Normandy and Picardy in the sixteenth century than to the language of Paris today. For example *-oir* has the pronunciation of an open *e*, which in France is archaic. Their old legends carry words in ancient forms, as, for example, the preservation of an *s* in *notre* instead of the circumflex. These are but casual allusions; to do the matter justice would require an article in itself. Many of the words in use by the *habitant* of today have a different meaning from the same words as used in France. These are examples of differentiation rather than crystallization. Not a few words are due to the physical or cultural environment, as *alright*, *mail*, and the verbs *mailé*, *canoe*, *beaté* (for beaten). Semple tells us that the *habitant* is so accustomed to the

[4] Josiah Royce: Race Questions, Provincialism, and other American Problems, New York, 1908.

[5] For much of the journey in the field the writer had the companionship of Mr. Lander MacClintock of the French Department, University of Chicago, and is indebted to him specially as a student of Old French and Old France.

FIG. 8.

FIG. 9.

FIG. 8—A lumber settlement on the Saguenay below Chicoutimi. The abrupt descent to the river of the slopes in the background, leaving only a narrow foreshore for human habitations, is also characteristic of the south shore of the Lower St. Lawrence, especially in Gaspé Peninsula. (Photo by Isaiah Bowman.)

FIG. 9—A ship unloading a winter's supply of molasses and coal at Murray Bay. The shore at low tide is over two miles from here.

canoe and its phraseology that he "disembarks" from his horse and "moors" it to a tree.[6] One is hailed with *bienvenu* as he enters a cabin.

Folklore

Recently Dr. C. M. Barbeau of the anthropological staff of the Canadian Geological Survey collected several hundred old legends, ballads, and verses from the natives of the more out-of-the-way villages which preserve in Old French the legends of northern France, such as Tristan and Isolde, a certain version of the Faust story, and the tales of the Round Table. These are still cherished and told by the simple people, who, little influenced by the complexities of the world and the extension of literature, retain these tales in their mind word for word and pass them on to succeeding generations.

I went with Dr. Barbeau to the cabin of an old man who was noted for his versatility in the art of ballad singing, and, as he sang to us, his daughter at the far end of the room crooned the words to the baby suckling at her breast. Unless the railway invades this town, bringing with it the distracting influences of outside culture, the baby will grow up to know and love these songs. Should the railway penetrate to Tadoussac, the chances are that the child will read the newspapers to the exclusion of the old songs; that Sir Galahad will be replaced by the Canadian Nick Carter, whoever he is; and that a beautiful example of the preservation of type, tradition and talent through isolation will be lost.

The Church

Another element of the French Canadian which illustrates crystallization and in a most significant manner is his mental attitude. He exhibits a simple faith which exceeds that of all his contemporaries in other portions of the American continent and to many is absolutely unknown. The beginning and the end of the *habitant's* thought lies in the Church. The grammar school, the college, and the newspaper turn to the Church to learn the limits beyond which their intellectual advance must not proceed. From youth to old age the Church's influence is constantly felt. The mass is the one event powerful enough to bring the entire population together, and there is scarcely a storm which can keep the farmer, however remote his home, from attending it. The *habitant* is medieval in his superstitions and absolute in his faith. Let the pile of crutches at the shrine of Ste. Anne de Beaupré bear witness. I have spoken elsewhere of the effect of this isolation upon morals. The Church, aided by the encompassing hills, has brought to these people a peace of conscience and a moral sense which are sublime. Nowhere else have I seen such temperance and orderliness of life.

Feudalism

There still exists here a modified feudalism, a survival of the seigniorial system. In Charlevoix County (Les Eboulements and Malbaie), upon the

[6] *Op. cit.*, p. 464.

north shore, and in a number of counties upon the south the land is held by a *seigneur* who may extract a fee from the *rentier*. He has full title vested in him by an ancient and royal grant, but today the rent that he may charge is regulated by law. The limit varies and may be as low as one-tenth of one per cent of the assessed value of the farm. M. Audet of Les Eboulements explained to me that the rent on his modest *pension* and the adjoining blacksmith shop was six dollars and a chicken annually, though recently the chicken had been "abolished." Today his *seigneur* rides over the estate upon a fine horse, and the peasantry stand beside the road to doff their hats. Beyond tradition and the modest fee this man has no rights of civil jurisdiction. The *habitant* may buy the land and frequently does, though because of centuries of occupation by the same family it is already virtually his. This buying up of land, together with hostile legislation, tends to do away with the un-American archaism of feudal observances.

Architecture

There are a host of other evidences of this ancient and little-modified civilization. In the older houses the architecture is distinctly Norman (Figs. 4, 5, 6), and when houses are rebuilt it is often along traditional lines. Barns were being re-thatched in the summer of 1916 in the Gouffre valley (Fig. 5). The corbeled second story so popular in Normandy is a common sight. Windmills of ancient wooden types are used throughout the south shore and upon islands exposed to the strong northwesterly winds blowing down the estuary. These clumsy mills are used mainly for threshing the grain but also for grinding it. At Trois Pistoles I found a modern barn to which was attached this old-fashioned contrivance. Within a mile of this barn men were building a shed over a newly constructed Old World oven such as is to be found on every estate in the region (Fig. 5)—this, too, in spite of the fact that there was in the house a modern range containing an oven. This reluctance to give up old customs, or to introduce innovations in a community where all have customs so much in common, is a characteristic and highly important indication. On Isle aux Coudres, which is monotonously flat once you have ascended the twenty-foot terrace, the carts are two-wheeled. This is a relic of the days when a Norman wheel tax made two wheels more economical than four. It is asserted by the loyal *habitant* that two wheels are better for certain sorts of rough road; but as a matter of fact the roads are not rough, and the conditions are the same as on the mainland of the south shore where the farmer uses four-wheeled carts to advantage. This difference of accessibility in various portions and corners of the province always brings out a variation in the degree of advancement of the inhabitants. Only in the poorer and less accessible regions was Dr. Barbeau able to find the old tales in any considerable number.

Example of Provincialism

This type of evidence could be given *ad infinitum*. One more example, however, must suffice. Royce's definition of provincialism requires that the individual succumb to the characteristics of the group. After the British "conquest" English and Scottish soldiers settled down at Murray Bay (Malbaie) and Fraserville (Rivière du Loup), towns which they named after their commanders. Today there is no trace of such settlement except family names. The descendants of these English and Scottish soldiers are French in thought, religion, language, and appearance. They have, of course, intermarried. At Bic I shared the Sunday dinner of a shoemaker. He could not speak a sentence of English, and yet his ancestral country was the same as mine. His name was Robert Burns.

OUR WATERWAY REQUIREMENTS

By ROBERT M. BROWN

Legislation

Fallacy of Present Policy

The River and Harbor Appropriation Bill passed in July, 1917, originally carried $38,000,000 to be distributed among 300 projects, 81 of which are new. In the report of the Committee on Commerce[1] in 1916 it was explained that a few waterways for which appropriations were made accommodated relatively a very small commerce because of the uncompleted state of the waterway, business depression, or "local causes of a temporary nature." The Committee in all cases continued the appropriation on these projects "in the hope that increased benefits may follow," but with the threat that unless an increased traffic be shown in a reasonable time the appropriation for maintenance would be discontinued. Herein lies one of the greatest fallacies of waterway management, namely, that commerce will result from waterway construction. Waterways should be improved, not to create commerce; commerce should create them.

Inadequacy of Special Bills

There are some signs that an omnibus river and harbor appropriation bill may be succeeded in time by a commission-governed waterway appropriation. A few years ago the Newlands Bill[2] began a consistent fight for a new waterway policy. The failure of this bill was the result, probably, of its altruistic character—the detailing of an enormous sum of money into the hands of a few people without definite instructions as to expenditure—and of its lack of promise of quick results. The minority report of the last river and harbor appropriation bill[3] advocated a national waterway commission[4] with exclusive authority over waterways as the one way out of the difficulty. The recommendations of this commission would be under Congressional approval, and, if the districts of the members were too severely neglected, there would be a chance to block the measure by establishing a deadlock. The Newlands Bill carried a lump appropriation of $60,000,000 per year for ten years to be placed at the disposal of a commission. Our waterways have suffered, are still suffering, from the unsatisfactory allotments of the annual river and harbor appropriation bill; it may be that a commission management would obviate the evils of this bill,

[1] *Senate Rept. No. 420, 64th Congr., 1st Sess.*, p. 10.
[2] *Senate Bill No. 2739, 63rd Congr., 1st Sess.*
[3] *House of Repr. Rept. No. 1289, Part II, 64th Congr., 2nd Sess.*
[4] *House of Repr. Bill No. 6821, 64th Congr., 2nd Sess.*

but at the same time there is some danger of establishing a form of government over waterways which would be only different in name.

Special bills calling for specific action on waterways are introduced into Congress during every session, and these, unless they are in accord with a national waterway policy, may be a great menace to our waterway system. For instance, there was introduced into the House of Representatives a bill[5] to provide for the control of the Mississippi and Sacramento River floods. The passage of such an act would be disastrous, probably, to all other functions of the river. Flood control is one of the necessities of waterways but it must be managed in such a way that navigation be not blocked, reclamation and protection be permitted, and water conservation be maintained. Since 1896 we have expended over $560,000,000 through the medium of the river and harbor acts, an average approximately of $27,000,000 per year. As a large amount of this money each year is appropriated for maintenance and not for the continued improvement of partially regulated streams, and as some of it is expended for projects of an experimental nature many of which are abandoned later, it is not an exaggeration to state that some of this money has been wasted. A strict accounting of this sum during the last twenty-one years would probably yield astonishing results. It is, of course, purely a mental exercise to figure out what would have resulted from the expenditure of this sum of money by a competent waterway board on one worthy project each year for twenty-one years, not in maintenance amounts but in sufficient quantities to complete each waterway and to make it an effective carrier of traffic.

Aims of Various Organizations

In addition to the bills of special nature, there are a number of powerful associations which, each devoted to a certain project and backing it with great persistence, have a narrow or limited view of our waterway problem. These groups are interested naturally in the task nearest at hand. The Mississippi River Levee Association has done an amount of commendable work in advertising the necessity of protection for the Mississippi Valley; but, in advocating one type of remedy to the exclusion of all others and in demanding protection at the expense of proper uses of the great river, this association has not been a national asset.

The Mississippi River Commission can point to a long record of service, but the act that created it does not permit the commission to conduct its endeavors along approved lines of water conservation, and furthermore it has committed itself to levee completion as the only method of protecting the alluvial basin to such a degree that no other policy can be entertained by it. In twenty-eight years two-thirds of the necessary yardage of levees have been completed. Out of 1,564 miles of levees in the system 1,237 are today below commission grade. Nearly a fourth of the area seeking pro-

[5] *House of Repr. Bill No. 14,777, 64th Congr., 2nd Sess.*

tection was overflowed during the 1916 flood. An excessive flood, which may occur any year, will always be disastrous to the basin under this régime. The commission has maintained a nine-foot waterway of 250 feet width since 1902 except that "for 18 days in 1903 and a few days in 1904 the depths at one bar were 8 and 8½ feet. For a few days there was less than 9 feet at five bars in 1908, seven bars in 1910, and five bars in 1914. At one bar in 1913 the required width was not maintained."[6] This is not a very commendable record of achievement for twenty-eight years: the fault may lie in the plan of appropriations or it may lie in the policy of the commission or in both.

The Atlantic Deeper Waterways Association rarely comes into conflict with the riverway organizations except as a factor in the distribution of the annual appropriation. The demand for a fourteen-foot channel from the Great Lakes to the Gulf was as dangerous and as purely selfish a measure as has existed in recent years. A few years ago the St. Louis convention of the Lakes-to-the-Gulf Deep Waterways Association sent a resolution to Congress "demanding that no less than fourteen feet should be permitted and should be accepted."[7] It was a movement tending to improve the situation of a small region to the neglect of other regions. The Ohio River, now the best traffic carrier of the Mississippi Basin, could not be joined to such a system except at a cost that would in itself be prohibitive. There was little reasonableness in the demand for a fourteen-foot depth, as the Lake carriers could not be floated economically in so shallow water and the river steamers were of a much less draft. As long as transshipment is necessary the nine-foot channel of the Mississippi River Commission, which has been maintained fairly consistently, is of sufficient depth. It is a mooted question whether even this nine-foot channel has been worth while.

In addition to these pleaders for special waterway privileges and others of similar complexity, there have been unorganized adherents to a special line of action. The most vigorous of these today is the reservoir-control group. This form of regulation has not been adequately tried out on large streams, and for this reason the arguments of this group have neither been proved nor refuted.

Lack of National Policy

It is evident that in our waterway policy we are a house divided against itself. The excellent reports which have been issued in recent years—the Final Report of the National Waterways Commission, 1912;[8] the Report of the Inland Waterways Commission, 1908;[9] and the Survey of the Mississippi River by a Special Board, 1909[10]—have perhaps accomplished something,

[6] Annual Report of the Mississippi River Commission for the Fiscal Year Ending June 30, 1916, in *Rept. Chief of Engineers, U. S. Army, 1916*, Pt. III, pp. 3299-3521; reference on pp. 3302-3303

[7] *Congressional Record*, Vol. 46, December, 1910, p. 178.

[8] *Senate Doc. No. 469, 62nd Congr., 2nd Sess.*

[9] *Senate Doc. No. 325, 60th Congr., 1st Sess.*, edition with appendix.

[10] *House of Repr. Doc. No. 50, 61st Congr., 1st Sess.*, edition with atlas.

but they have not been able to stop the momentum gained by the annual omnibus river and harbor bill nor have they in any marked degree prepared waterway advocates and experts for a uniformity of purpose. There is no such thing at present as a national waterway policy; the strife after a share in the annual appropriation is a catch-as-catch-can affair which is rendered disgraceful by provincialism and political intrigue in Congress. There is no greater need for our waterways today than a definite statement of aim to which most of our waterway adherents would be willing to subscribe.

Natural Factors

Large Tributary Population

Waterways cannot be expected to be successful unless they are connected with a densely settled district. Graphs I, II, III, IV, and V (Fig. 1) show

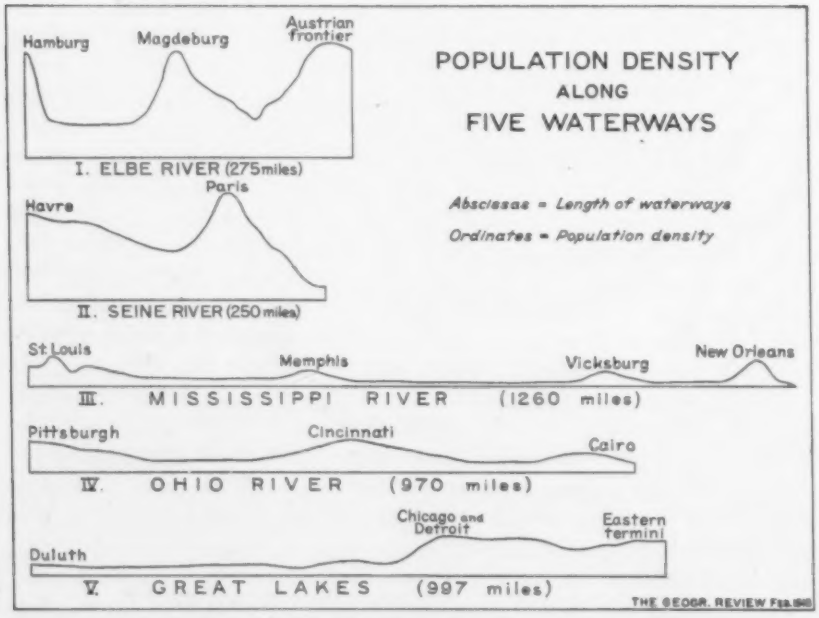

Fig. 1—Curves of densities of population along water routes.

the relative density of population along five waterways. The base lines are proportional to the length of the water routes, and the heights of the curves indicate the relative density of population along the way. The apexes of the Elbe curve (Graph I) mark Hamburg, the Magdeburg district, and the Dresden district (marked "Austrian frontier"); along the Seine (Graph II) the apex indicates the location of Paris; and in the Mississippi River curve (Graph III) southern Illinois (marked "St. Louis"), Memphis, Vicksburg, and New Orleans appear in slight irregularities. The Elbe

River is not adjacent to any coal mine district in Germany, so that the necessity for shipment up river from the port of Hamburg of this commodity to the centers of dense population and industry is great. A similar situation is found on the Seine. The upstream traffic from Havre to Paris exceeds the downstream traffic, and this difference is accounted for by the demands of the densely populated Paris district for coal. Above Paris, the bulk of the traffic, about 75 per cent of the total, is downstream, bringing grain and building materials to the city.

Available Trade Commodities

Not easily separated from the density of population is the commodity factor in waterway success. It is almost an axiom that every waterway, to be successful, must have at its terminals either a dense population or a commodity of trade in sufficient quantity to promise a continual output. In the European waterways used as types above, the centers of great population, besides demanding the necessities of life, ship in return over the waterways their manufactured or agricultural products. Thus the Dresden district (Graph I) ships glassware and crockery, the Madgeburg district ships sugar and machinery, and the Paris district (Graph II) ships a variety of manufactured articles. The Great Lakes waterway illustrates the combination of a dense population and an economic commodity. Around the western terminus there exist in abundance iron ore and lumber, while the northwestern hinterland adds grain and flour. The maximum amount of annual tonnage passing through the Saint Marys Canal up to 1916 was 79,718,344 short tons (1913). Around the eastern terminus (Graph V) there is a fairly dense population which receives the raw materials of the Lake Superior district and converts them into manufactured articles. The Mississippi River has the fertile prairies, and, through its tributary the Ohio River (Graph IV), it taps the coal fields of western Pennsylvania; but along its route there are no thickly settled districts, and its southern terminus, New Orleans, is not a great city. Furthermore, the grain which made a large percentage of the tonnage of the river in the heyday of its commercial supremacy is not conveniently located at the water's edge, is too decentralized, and is thus not destined to be in any large degree a river-borne commodity. During the year 1915 the traffic on the Mississippi River passing any zone, as Memphis to Vicksburg, was 2,198,814 tons, made up largely of stone, gravel and sand (892,940 tons), and coal and coke (892,840 tons).

Waterways as Outlets

Short streams, as for example the western European rivers, become successful waterways independent of their direction of flow because they connect a densely settled interior with the coast by a direct line. In Russia, however, aside from the Neva and the Volga Rivers, very little tonnage is carried by the streams, although they are navigable in the aggregate for

nearly 110,000 miles. The east-and-west rivers through the heart of Russia are the important highways. The north-flowing streams to the Arctic and the south-flowing streams to the Black and Caspian Seas do not parallel heavy traffic lines, and consequently they bear little tonnage. A similar difficulty confronts the Mississippi River; its big tributaries open through the main stream to the sub-tropical regions rather than from one economic region to another in the middle zone, and it is thus of secondary importance as a waterway.

Development

Necessity for an Adequate Channel

Given the natural factors for a successful waterway, one necessary essential is an adequate channel. We have been under a double illusion for a long period of time over the waterway situation: on the one hand we are tempted to believe that commerce will result from river improvement; and on the other we believe that railroad freight rates can be lowered by improving waterways. A waterway policy built upon faith will be a failure. Improvement of waterway channels is legitimate only where trade demands more or better carriers. When this stage is reached, it becomes a profitable investment to spend large sums of money to facilitate the movement of boats.

A national waterway scheme should attempt some co-ordination in the depth of the channel. A three-foot waterway on the upper Mississippi River increasing gradually downstream to a nine-foot waterway is not economical. Our railroad companies adopted independent policies of road gage in their earlier history, but the advantages in economy and time of a standard gage have driven every line of any other gage out of business today. The expense of unloading and loading at the stations where the river depth changes is argument enough against such a plan. The fourteen-foot waterway demand of the Lakes-to-the-Gulf Deep Waterways Association and the nine-foot waterway of the Mississippi River Commission are examples of the lack of uniformity in waterway ideals.

The time element must be considered as a factor in a successful waterway policy. Many of our great canals have been built to shorten sea routes. The more direct the route between any two points, the more profitable it will be. The great meanders of the Mississippi River make the distance from Cairo to New Orleans over twice as great by water as by rail. It is frequently claimed that the Rhine, in spite of its great meanders, is a successful waterway. It will be found on investigation, however, that the stretch of the Rhine from Mannheim, at the mouth of the Neckar and in the lower part of the great agricultural lowland, to Rotterdam carries most of the commerce of that stream. This stretch is remarkably free from windings, and the distance from Mannheim to Rotterdam by water, 351 miles, is only 41 miles (13 per cent) greater than that by rail. Our early railroads were a combination of grades and curves; these have been or are being elimi-

nated, sometimes at great expense. In like manner a successful waterway must straighten its line and employ as few dams as possible to be circumvented by time-consuming lifting and lowering contrivances.

Impediments to navigation should be eliminated as far as practicable. The uncertainty of most of our rivers has been a great handicap. On the Kentucky River[11] since the opening of the slack-water project some of the locks have been out of commission for a part of the time every year, being damaged by freshets or ice. In 1909 navigation was entirely suspended for 138 days and again in 1912 for 40 days. It is a sad commentary on our waterway policy to note that when all the commodities of the upper Kentucky River were, because of the uncertainty of the river way, accepting the higher tariffs of the railroads, the slack-water project, which, too, was never successful because of its inadequacy, became an obstruction to the shipment of lumber, the only industry of importance in the upper river today. The result has been that some of the lumber mills below the dams have had to go out of business, and mills have sprung up above the dams. A frequent obstacle to navigation in nearly every river in the country is the excessively high or low water stage of the stream, but this difficulty is one that in most rivers can be easily overcome.

Reduction in Operating Cost

A decrease in the cost of handling commodities and of operating is another essential to a successful waterway. Here lies one of the reasons for a standardized canal system, especially on shallow streams. Railroads send cars from producer to consumer under the régime of a standard rail gage. The ocean and Great Lakes traffic lines and the Ohio coal carriers have reduced overhead charges to a minimum and have achieved success. Terminal facilities of most river stations, however, have not improved since their inception. It is reported[12] that the number of pounds of fuel expended per ton-mile is on the average for the railroads 0.066; for the Great Lakes carriers, 0.029; for the Ohio River tow boats, 0.021; and for the Mississippi River packet, 1.129. Evidently the packet is not the most economical carrier. In the number of days' labor per 100,000 ton-miles, the same authority quotes for railroads, 2.5; for the Great Lakes carriers, 0.9; for the Ohio River tow boats, 1.31; and for the Mississippi River packets, 63.64. The geographers who walked over the wide sloping cobbled approach to the steamer which took the Transcontinental Excursion of the American Geographical Society down the river in 1912 from Memphis can easily believe that the expense of loading and unloading a Mississippi River freight boat must be excessive. When there is proper equipment and the haulage is moderately long, so that the expense of terminals is distributed over a considerable

[11] Mary Verhoeff: The Kentucky River Navigation, *Filson Club Publs. No. 28*, Louisville, 1917.

[12] W. M. Black: Some Problems of Inland Waterway Transportation, *Repr. of Proc. of the Ninth Ann. Convention of the Atlantic Deeper Waterways Assoc. Held at Philadelphia, Sept. 12-15, 1916*, Philadelphia 1917, pp. 54-69; references on p. 68.

mileage, water transportation rates are lower than rail rates. This is true on the Great Lakes, where one ton of iron ore is transported an average distance of approximately 850 miles for 65 cents (including cost of loading and unloading, carrying, and terminal charges), or at the rate of less than eight-tenths of a mill per ton-mile; and also on the Ohio River for the 2,000 miles from Pittsburgh to New Orleans, where the charge is $1.25 per ton for coal, or at the rate of about six-tenths of a mill per ton-mile. The lowest rail rate on coal in the United States is two and one-half mills per ton-mile.

Railroad competition has been frequently assigned as the reason of the declining traffic on our waterways. In many instances, however, the waterways have been so inefficiently managed that competition is hardly the proper word to use. Many waterway advocates, furthermore, charge the railroads with malicious competition and demand in strong terms federal control. Legitimate railroad competition with any waterway is particularly formidable because of the ability of the roads to keep their lines open under varying conditions, to move freight quickly, to overcome the decentralization of products by numerous interramifications of lines, and to transport commodities without break of bulk to a greater extent than can be effected by any waterway system. The time is going by when railroads can be charged with manipulating rates in order to offset competition, and when waterways can be advocated as a factor in railroad rates. Formerly waterways exercised a potent influence in rate reduction, but this influence was extremely limited in extent, and the loss which the railroads suffered because of waterway competition was generally charged against the public on roads that had no competing line. The extension of the powers of the Interstate Commerce Commission throughout the country will be instrumental probably in controlling traffic rates so that the injustices of former years can no longer be alleged.

Consideration for a River's Other Functions

Finally, a river waterway should be so regulated as to allow the river to perform its other legitimate functions, and, conversely, other uses of the river should not block its use as a waterway. It is to be understood, however, that the waters of some streams may properly be devoted to a particular purpose to the exclusion of all other uses, as, for instance, in the great reclamation projects of the arid areas of the United States; but wherever it is possible the waters of the streams ought to serve many uses. River regulation, navigation, flood control, water conservation, and water utilization—all must be considered. Organizations promoting a Lakes-to-the-Gulf fourteen-foot waterway or any single-feature project are detrimental to a national waterway policy, since they base their demands on provincial and therefore selfish interests. Improvements on any stream which sacrifice one function of the waters to another are wasteful and undeserving of Government sanction.

OCEAN TEMPERATURES OFF THE COAST OF PERU

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Temperate Waters in Tropical Regions

No feature of the coast of Peru is more significant as affecting the character of its marine fauna and flora than the Humboldt, or Peruvian, Current. It is scarcely necessary to apply the limitation "marine," since the climatic conditions of islands and mainland are so profoundly affected by the contiguity of a cold stream and land warmed by a tropical sun that no animal or plant life, terrestrial as well as marine, can escape its effect. In a previous paper[1] on the general fishery conditions of the coast, I stated:

> To find upon the coast of the United States a summer temperature of the ocean water corresponding to that of Callao at 12° S. one would go to about the latitude of New York on the Atlantic side (41° N.) or Monterey on the Pacific (36° N.). The Peruvian Current, in conjunction with other factors, particularly the constancy of the winds of the coast, produces a relative uniformity of temperature conditions. There is little variation in the water temperature from hour to hour during the day, little difference from month to month during the year, and a relatively small change from latitude to latitude. It is probable that such variations as are found are due more to very local conditions, or to the swinging of the current, than to seasonal changes or differences of latitude. . . . . .
>
> With such low water temperatures a tropical fauna is, of course, absent. Corals are wanting, sponges nearly so, and the general character of the fauna and flora of the region is such as would ordinarily be found in much higher latitudes.

Comparatively recently several reports on the fauna and flora of the coast have appeared[2], based on the writer's collections; it may, therefore, be of particular value to give in greater detail the observations upon which the general statements were founded. A qualification is freely made that the temperature records cannot pretend to the most desirable scientific accuracy. The best instruments were not regularly available. The observations were made during nearly twenty months of travel in 1907-08, often under rather difficult conditions and with other objects in view. While it may be regretted that the need of an adequate supply of tested thermometers was not anticipated, it is clear that a slight error in individual readings will not affect the bearings of the data upon the general conditions of animal or plant life.

Two striking illustrations of the effect of the temperature upon the distribution of semi-aquatic animals may be mentioned. A fur seal is familiar to the Peruvian fishermen under the name of *lobo fino*, or *lobo de los pelos*,

[1] "The Fisheries and the Guano Industry of Peru," Proceedings of the Fourth International Fishery Congress, *Bull. Bur. of Fisheries*, Vol. 28, 1908, Pt. I, pp. 333-365.

[2] Mainly in *Proc. U. S. Natl. Museum*, Vol. 37, 1909, and Vol. 38, 1910, *U. S. Natl. Museum Bull. 95*, 1917, and *Memoirs Torrey Botan. Club*, Vol. 15, 1914.

and seems to range as far north as Paracas Bay at 14° S. latitude, where it is supposed to breed. The penguin, generally associated with higher latitudes, is here common within the tropics. I observed it as near the equator as the Lobos de Afuera islands, about 7° S. It may be added that while sea turtles are common on the coast it could not be learned that they made nests upon the beaches south of Tumbes, 3½° from the equator, and it is extremely improbable that they would breed on the colder shores to the south.

There is an abundance of pelagic life that is not characteristic of tropical latitudes. The influence of the ocean temperature conditions upon the marine fauna and flora is, indeed, too complex and far-reaching to be susceptible of brief analysis. In the first place, the proximity of cold waters and warm lands creates a condition that makes condensation and rainfall virtually impossible. Innumerable small surface organisms are saved from the destruction that might be caused by excessive precipitation; and the clear sunlight is of inestimable value for the growth of the minute plants that form the basis of the food supply of all the marine animals. The higher value of colder waters for absorption of the gases necessary for organic life, the remarkably slight daily and seasonal variations of temperature, the absence of conditions to promote evaporation—these and other features of the Peruvian waters must be reflected in one way or another in the abundance and variety of the animal and plant life.[3]

Uniformity in Temperature Conditions

It is probable that such variations as are found are due more to very local conditions or to the swinging of the current than to seasonal changes or differences of latitude. For example, at Lobos de Afuera (7° S.) during the twelve days March 16 to 28 (range of temperature 19°-22.4° C.) the average of the records taken at noon was but three-tenths of a degree Centigrade higher than the average of those at 8 A. M., or two-tenths higher than the records at 8 P. M.; and at Lobos de Tierra (6½° S.), nearer shore and less directly in the current, the noon average was only seven-tenths of a degree greater than the identical averages of morning and evening readings. The extreme readings during nine days of bright weather were but one degree apart (20°-21° C.).

These records at the islands of Lobos de Afuera and Lobos de Tierra were made at the very close of the summer. At the beginning of the following summer (December) records were again made at the same places, with the result that the averages were 2.3° and 1.7° lower, respectively, than before. It may be noted that at the beginning of summer the current is flowing from a region which has been passing through winter, while at the

[3] "No waters in the ocean so teem with life as those on the west coast of South America," says Buchanan (J. Y. Buchanan: On the Similarities in the Physical Geography of the Great Oceans, *Proc. Royal Geogr. Soc.*, Vol. 8, 1886, pp. 753-770, with map and diagrams; reference on p. 766.)

end of summer the current is passing from a region that has been in summer, and this may partly explain the fact that the early summer temperature noted was lower than the late summer temperature of the preceding season. It is possible, too, that conditions of a more temporary nature may have caused the small but readily appreciable differences.

At Callao, 12° S., I found summer water temperatures of 15°-19° (59°-66° F.) and winter temperatures of 16.5°-19° (62°-66° F.).[4] That the winter temperatures were higher than the summer is attributable in part to the fact that these records were made in the mole instead of in the bay (as in summer), and experience shows that the water in the bay is one or two degrees colder than that in the mole. Also, doubtless, the temperature of the stream as a whole is slightly higher at the close of summer or in early winter than at the close of winter or in early summer, and it so happens that the Callao records were taken chiefly in early winter and in early summer.

The *Albatross* records of November 12-22, 1904, to be referred to again, were two degrees higher (19°, 20° C.) than my records of the same month in 1908.

A winter tourist might travel on the coast of Peru a distance equal to that from New York to Nassau or Miami, Florida, without finding a substantial difference in the temperature of the water for bathing. Thus, fifteen records at Paita (5° S.) in April and May, 1907 (end of summer or early winter), gave an average of 18.4°, and the lowest was 15.5°; while two records at Paita of December 29 and 30, 1907 (midsummer), were 17° and 17.5°, taken close to shore and about 8 P. M. A record at Chimbote (9° S.) in the same month of May was 17.5°; at Callao, May

FIG. 1—Sketch map of the coast of Peru showing the location of the places mentioned in the text. Scale, 1:13,600,000.

[4] Compare the record for Callao shown in Fig. 76 of Isaiah Bowman's "The Andes of Southern Peru." New York, 1916. This record shows land and water temperatures from June to September, 1912.

20, 16.5°; while at Mollendo (17° S.) in midwinter, 1908, the water was at 16°.

While I have not such a systematic series of records as would justify inferences regarding the nature of the current, I can interpret the relations of 326 records taken at many points between Paita and Mollendo, from January, 1907, to July, 1908, only on the following tentative assumptions:

(a) That the Peruvian Current undergoes little change of temperature in traversing the 1,000 knots from Mollendo to Paita.

(b) That such differences as occur in my readings are due in small part to seasonal changes, likewise in small part to a want of temperature homogeneity in the current (with areas of warmer and colder water), or to the swinging of the stream toward or away from the coast (movements that are assumed by the fishermen), but in greater measure to entirely local influences. Allowance should probably be made, too, for differences from year to year according to the prevalence of icebergs in the southern seas or to other conditions affecting the stream at its origin.

Comparison of some "Albatross" Records of 1904

Examination of the dredging and hydrographic operations of the *Albatross* in this region in 1904[5] reveals an interesting fact. Near Sechura Bay (5° 46′ S., 81° 27′ W.) November 12, 1904, the surface temperatures were 63°, 64°, and 65° F. (17.2°-18.3° C.) in different localities. As the vessel sailed westward and southward across the Peruvian Current and away from the equator, the temperature rose to 69° at about the eighty-fourth meridian, 71°-72° at the eighty-sixth, 69°-73° at eighty-seven and a half, and 69°-70° near the ninetieth at latitude eleven to fourteen degrees south. Returning eastward, the temperature fell to 66° at about the seventy-eighth meridian and twelve degrees south. The records made in the region of 78° W. and 12°-13° S. (vicinity of Callao) were 66° and 68° F. Hence it appears that, although the *Albatross* went toward the source of the current for six degrees of latitude, from Sechura to Callao, the surface water was found to be 2° to 5° Fahrenheit warmer in the higher latitude, or farther removed from the equator, even near the coast. The explanation of this is not apparent. Again, in crossing the stream and passing into the central eddy, as it were, the water was found to be 7° or 8° warmer, although the latitude was about eight degrees higher.[6] It should be remarked, however, that these latter temperatures, being found farther off shore, were therefore in waters removed from the influence of any conditions that might cause an upwelling of colder bottom waters along the coast line.

[5] Dredging and Hydrographic Records of Fisheries Steamer *Albatross* for 1904 and 1905, *Bur. of Fisheries Doc. No. 604*, 1906, pp. 54-58.

[6] Compare the figures obtained by Capt. Paul Hoffmann and quoted by Hann (Julius Hann: Handbuch der Klimatologie, 3rd edit., 3 vols., Stuttgart, 1908-11; reference in Vol. 1, p. 173). The water temperature of 18.2° on the coast of Callao increased progressively to 27.0° at 135 nautical miles from shore.

Possible Significance of Vertical Currents

The possible significance of such a phenomenon has been called to my attention by Professor C. A. Kofoid. On the western shores of other continents its operation is evident. The case at first thought seems less clear for an upward movement of waters along the Peruvian coast. There is at no season a prevailing offshore wind, since the conditions are practically always such as to cause a drift of air from the colder water to the warmer land. We have, indeed, a practically uniform current with a following wind, paralleling or impinging against a generally unbroken coast line.[7] It is perhaps in the momentum or centrifugal force of the current, bearing against a westward-tending coast, that a cause of upwelling may be found. The effect of the momentum would be to cause the entire periphery of the stream to slide up the continental slope; but the water will not pile up against the coast to any great extent, because, under the influence of gravity, the surface waters would roll away from the coast, thus being continually replaced at the surface near the shore by waters from below. The practical result of these movements would be a slow peripheral upheaval, the direction tangential to the course of the stream and the curve a long spiral. Some evidence bearing on this suggestion might be obtained by comparison of temperature conditions at points farther south, where the coast line has no westward inclination, as at Iquique, Antofagasta, and Valparaiso. I do not find that there is in my records anything to throw

[7] It would seem important, however, to distinguish between the local development of the winds along the coast—where land and sea breezes play so prominent a part—and the conditions out at sea, where the trade wind drives the surface water from the southeast, inducing a compensatory rise to the leeward strong in proportion to the remarkable strength and development of the trades in the Southern Pacific. This would seem the basal influence, providing the conditions under which the local wind operates. On this question the references given by Hann (*loc. cit.*) should be consulted. It may here be noted that one of the strongest arguments in favor of the upwelling theory is the insignificant gain in temperature of the current as it slowly progresses from Valparaiso to Callao, a movement requiring four months. Capt. Paul Hoffmann (Otto Krümmel: Handbuch der Ozeanographie, 2nd edit., 2 vols., Stuttgart, 1907 and 1911; reference in Vol. 2, p. 715) found the November temperatures at Valparaiso and Callao to be 14.8° and 14.9° respectively. Again, Buchanan (*op. cit.*, p. 765) found the temperature from Coquimbo (30° S.) to Pisagua (19½° S.) to average 60° F. (15.6° C.), and along the coast from Independencia Bay northward the average was 61° F. (16.1° C.), though local variations were considerable.

In this connection a historical note may be of interest. The theory that the upwelling of cold bottom water causes the cool ocean temperatures off the lee coasts of the continents in mid-latitudes was first advanced, it would seem, in 1871 by the physicist E. Witte (*Poggendorff's Annal. der Physik und Chemie*, Vol. 142, 1871, p. 289) and in 1875 by Capt. L. E. Dinklage, later of the German Hydrographic Office in Hamburg (cf. A. Supan: Das kalte Auftriebwasser, *Petermanns Mitt.*, Vol. 37, 1891, p. 293). Later important discussions are to be found in Capt. Paul Hoffmann's "Zur Mechanik der Meeresströmungen an der Oberfläche der Ozeane," Berlin, 1884, and in A. Puff's "Das kalte Auftriebwasser," University of Marburg thesis, 1890. Through the researches of V. W. Ekman of Christiania (Beiträge zur Theorie der Meeresströmungen, *Ann. der Hydrogr. u. Marit. Meteorol.*, Vol. 34, 1906, pp. 423-430, 472-484, 527-540, 566-583) the theory has been placed on the firm foundation of mathematical analysis. It is accepted by such authorities as Hann (*op. cit.*), Krümmel (*op. cit.*), Supan (Grundzüge der physischen Erdkunde), and Sir John Murray (The Ocean). In this country it has been discussed, mainly in its application to the California Current, by Dr. G. F. McEwen (The Distribution of Ocean Temperatures along the West Coast of North America Deduced from Ekman's Theory of the Upwelling of Cold Water from the Adjacent Ocean Depths, *Internatl. Revue der gesamt. Hydrobiol. u. Hydrogr.*, Vol. 5, 1912, pp. 243-286; Peculiarities of the California Climate Explained on the Basis of General Principles of Atmospheric and Oceanic Circulation, *Monthly Weather Rev.*, Vol. 42, 1914, pp. 14-23; Oceanic Circulation and Temperature Off the Pacific Coast, in "Nature and Science on the Pacific Coast" (guide book for A. A. A. S. meeting in San Francisco, 1915), pp. 133-140.—Edit. Note.

much light, either in an affirmative or in a negative way, upon the question of the influence of vertical currents, if such occur, upon the surface temperatures. On the one hand, we do not find the variations we might expect where colder bottom waters are being drawn up to mingle with warmer surface waters. On the other hand, we have to admit that the absence of contrasting temperatures is not evidence that such movements do not occur, but only that they do not occur in such a way as to produce surface areas of markedly different temperatures; and this is what we should probably expect in view of the fact that the conditions tending to cause the vertical movements, if any, are practically uniform, except as they might be more pronounced where the shore line tended more sharply to the west or where the continental slope was steeper.

Direct Influence of Peruvian Current Upon the Coast

The Peruvian Current is not, like the Gulf Stream of the Atlantic, a remote influence as affecting the shores. It passes in close proximity to the coast, literally bathing the shores, and its effect is enforced by the general absence of shallows and enclosed bays where the coastal waters might be substantially warmed. It is a very evident phenomenon. The fisherman returning along the coast from a short trip to the north feels the force of the current distinctly. Steamers on the coast maintain a ten per cent higher fare for the southern journey than for a trip northward of the same length. Even in a small boat lying at anchor near an island the water may be observed to flow by like the current of a river. An equally striking manifestation of the current is gained when one observes from the heights of an island, such as one of the Guañapes, the line of surf-made foam streaming constantly away to the northward.

It is locally assumed that the current has certain swinging movements, and these are of considerable significance to the fisheries. *Cuando atraca el corriente* and *cuando se aleja* ("when the current approaches" and "when it recedes") are common terms among the fishermen, for such pelagic fishes as the *monito, sierra, albacore, dorado,* as well as the mackerel and *anchobetas,* may abound when the current "approaches," while they are less available when the current "recedes."

It would be interesting to know to what extent, if at all, the Peruvian Current may occasionally be pushed back or overflowed by the northern current. While I am without observations on this point, I would mention the following information furnished me in response to many inquiries. It is not uncommon for a current from the north—locally known as El Niño from its frequency during the Christmas season—to prevail in the region of Tumbes at 3½° S.; a reliable informant told me that he had witnessed a current from the north while at Lobitos Cove, just north of Paita (5° S.), which left on the beach quantities of drift with snakes, etc. Mr. Kaufmann at Pacasmayo told me he had known equatorial drifts and an alligator to

have been left on the beach there (7½° S.). He regarded the occurrence as remarkable but did not believe there had been any change in the direction of flow. He was inclined to suppose that the drift and the alligator had made a long journey after being carried out on the westward equatorial current.[8]

Indeed, an effective reversal of flow, bringing the warm equatorial or northern waters to displace the southern waters, could hardly be supposed to occur without affecting the fixed marine fauna and flora in a conspicuous and unmistakable way. There is, however, nothing inherently improbable in the supposition that under certain conditions the warmer and lighter equatorial waters might overflow the colder and heavier Peruvian Current to a more southern latitude than usual and thus bring the equatorial drift south to a point where, under the action of the winds, it would be thrown ashore at such a latitude as Pacasmayo. This might occur without manifestation of southward flow along the shore.

Data Bearing on Local and Seasonal Variations

The data of local variation in given seasons are of interest in this connection, and for convenience of examination the following tables are offered.

Maximum Local Variation

Paita, bay protected on the south	5.0° C.
Chimbote, bay largely enclosed	4.5
Pacasmayo, bay with little protection	4.6
Lobos de Afuera, bay between islands 30 miles off shore	3.4 to 3.0

Minimum Local Variation

Pisco, bay protected on the south	2.0° C.
Callao, bay protected on the south	2.0
Independencia Bay, bay largely shut in from ocean	1.0
Mollendo, on very exposed shore	0.0
Lobos de Tierra, islands 12 miles off shore	0.5 to 1.0
Chincha Islands, islands 10 miles off shore	1.5

Intermediate Degree of Local Variation

Callao, bay partially protected	2.5° C.
Guañape Islands, islands about 10 miles off shore	2.5° C.

These data are puzzling only at first glance. We find the maximum local variation where eddies are to be inferred: Paita Bay, Chimbote Bay, Pacasmayo Bay, Lobos de Afuera Bay. We find minimum local variation where the stations are exposed: Mollendo, Chincha Islands, Lobos de Tierra. (It is to be remarked that at both the Chincha and Lobos de Tierra Islands the temperatures were taken on the inshore sides, not protected from a

[8] The northern current has also attracted a certain amount of scientific notice. Following the observations of Lartigue, 1822, Ray, Fitz Roy, Findlay, and others have remarked on its peculiarities. In 1891 the extraordinary rains of the north Peruvian coast were associated with an intense development of the current. Interest awakened by the occurrence took shape in papers contributed to the *Bol. Soc. Geogr. de Lima* (Luis Carranza: Contra-corriente marítima, observada en Paita y Pacasmayo, Vol. 1, 1892 pp. 344-345; Camilo N. Carrillo: Hidrografía oceánica, Vol. 2, 1893, pp. 72-110; F. A. Pezet: La contra corriente "El Niño" en la costa norte del Perú, Vol. 5, 1896, pp. 457-461.

north or south current but protected from any movement with a tendency east or west.) We also find little variation in Independencia Bay, but the openings are at the northern and southern extremities of a long bay. Callao Bay, being open to the current on the south, is less liable to an eddy; the same cannot be said of Pisco Bay, but the shore current there passing through the straits between Paracas Peninsula and San Gallan Island may affect the mainland shore as far as the port of Pisco, though there is an undoubted eddy in the southern extremity of the bay. Guañape alone offers a somewhat greater degree of variation than we should expect by comparison with Lobos de Tierra below and the Chincha Islands above.

It is inconceivable that the surface temperature could remain so little affected while the current traverses so great a distance, except there occur an intermingling of waters from below; yet, if any inference can be drawn from the observations here offered, it must be that the vertical movements are not localized but are generally distributed and perhaps continuous. The exact nature and the vertical extent of the movements certainly await further investigation.

Data bearing on seasonal variations are expressed in the following tables, giving the difference between averages taken at given localities in different seasons of the year:

Table of Seasonal Variations

Lobos de Tierra, April, Dec.	1.7° C.	(see below)
Lobos de Afuera, March, Nov.	2.3	" "
Callao, various months	1.6	" "
Chincha Islands, June 1907, July 1908	1.3	" "

Lobos de Tierra, March, April 1907, average of 20 readings	20.5° C.
" " Dec. 1907, " " 4 "	18.8
Difference	1.7° C.
Lobos de Afuera, March 1907, average of 31 readings	20.5° C.
" " Nov. 1907, " " 12 "	18.2
Difference	2.3° C.
Callao, Jan. 1907, average of 10 readings	16.5° C.
Oct. " 9	16
Nov. " 6	16.7
April 1908, 15	17.6
May " 24	17.4
June " 26	17.3
July " 4	17.4
Difference at Callao between lowest monthly average (16°) and highest average (17.6°)	1.6° C.
Isolated records are not included.	
Chincha Islands, June 1907, average of 11 readings	16.1° C.
" " July 1908, " " 6 "	17.4
Difference	1.3° C.

The data bearing on local variations, some of which have already been given, grouped into maximum and minimum values, are here cited more fully in geographical order. The following table expresses the difference between extreme temperatures taken at a given locality in one season. Such variations are much more pronounced than the difference of averages at different seasons. It is to be remembered, however, that these variations cannot be attributed to the condition of the weather nor, ordinarily, to the time of day when the record was made.

Table of Local Variations (In Geographical Order)

LATITUDE	PLACE	MONTH		READINGS	VARIATION
5°	Paita	April	1907	15	5.0° C.
6½°	Lobos de Tierra	April	"	20	0.5°
	Lobos de Tierra	Dec.	"	4	1.0°
7°	Lobos de Afuera	March	"	31	3.4°
	Lobos de Afuera	Nov.-Dec.	"	12	3.0°
7½°	Pacasmayo	March	"	14	4.6°
8½°	Guañape Islands	March	"	10	2.5°
9°	Ferrol (Chimbote)	March	"	12	4.5°
12°	Callao	April	1908	15	2.5°
	Callao	June	"	26	2.0°
13¾°	Pisco	June	1907	11	2.0°
13¾°	Chincha Islands	June	"	11	1.5°
	Chincha Islands	July	1908	6	1.5°
13¾°	Ballestas Islands	May-June	1908	11	3.0°
14¼°	Independencia Bay	June	"	8	1.0°
17°	Mollendo	July	1908	4	0.0°

Generally, as may be seen, the amount of variation (changes of temperature of the water in a given locality, without change of season) is greater in the regions of lower latitudes than in those of higher latitudes.

SOME CHINESE CONTRIBUTIONS TO METEOROLOGY

By CO-CHING CHU

Before the introduction of the western sciences, meteorology in China never advanced beyond the stage of prognostication by proverbs. Although meteorological instruments had been invented (some of them preceded the western discoveries by several centuries), yet they were never made use of on a large scale, and were looked upon rather as curiosities than as instruments to be utilized for human benefit.

Weather Proverbs

Weather proverbs are numerous in China, and examples may be found in the classics as well as in modern folklore. As these proverbs are based mostly on observation and experience, it is not surprising that some of them should coincide with those of the West. Thus in Tsu-Tsz, a blank-verse poem, written about 200-300 B. C., we have the saying, "Stay at home when the morning sky appears red, but look for a good day's travel when the evening clouds turn crimson."[1] Lao-Tze (604-?), the author of Tao-Teh-King,[2] said that heavy showers never last the whole morning, sharp thunders never last the whole day. Movement of the clouds as a prognostication of weather did not escape the notice of the early Chinese. In the writings of a scholar in the Han Dynasty, we find the saying that when clouds are going east traveling will be good, but when clouds are going west horses and carriages will be soiled. The occurrence of haloes was also believed by the Chinese to be the forerunner of a storm.

Meteorological Instruments

Although the use of the kite as a meteorological instrument to explore the upper air is of recent origin, yet, as a weapon of warfare, the kite was known to the Chinese at a very early date. Professor Rotch mentions[3] that two hundred years after the alleged invention of a wooden dove by Archytas of Tarentum (i. e. about 200 B. C.), a Chinese general, Han Sin, employed kites as a means of communication with a garrison of a besieged town. As a matter of fact the use of kites for military operations was known in China even before the days of Archytas. In the writings of Moti,[4] one of Confucius' most formidable rivals, who flourished between 500 and 400 B. C., mention was made.[5] of a noted genius, Kung-Shu Pan, who spent three

[1] *Chinese Meteorol. and Astron. Mag.*, Vol. 2, 1916, p. 57, Pekin. [In Chinese.]

[2] This book has been translated into several European languages. Possibly the best known English translation is that of Dr. Paul Carus (Chicago, 1898).

[3] A. L. Rotch: Sounding the Ocean of Air, New York, 1900, p. 117.

[4] See J. W. Bashford: China: An Interpretation, New York, 1916, p. 186. The Encyclopædia Britannica (11th ed., Vol. 6, p. 226) puts Moti in the period 500-400 B. C. Professor Giles was apparently in error when he named Moti as a philosopher in the period 300-200 B. C. in his "Confucius and His Rivals."

[5] End of Book 13.

years in constructing a bird of wood and bamboo, which when finished flew in the air for three days and three nights without apparent tendency to fall. Kung-Shu Pan constructed the bird as a device to attack the capital of Sung, one of the federal states at that time, in the interest of another state, Tsou.

Another instrument connected with meteorology and known to the early Chinese is the seismometer. Chang Hun (78-139 A. D.), who invented it, was well known in the later Han Dynasty for his literary works. His odes to Singan and Loyang were particularly celebrated. It is said that he spent ten years in writing the odes and that when they were finished the price of paper went up by leaps and bounds, showing how popular his work must have been. He seems to have been a versatile person, as he also invented several astronomical instruments and wrote an astronomical essay, Ling-Hsien, in which he expounded his theory of creation. He also calculated the value of π to be the square root of ten.[6] The seismometer was known as "waiting wind seismometer": the significance of the term "waiting wind" is not clear. This instrument has been described and illustrated by John Milne.[7]

In Chinese history we sometimes find references to wind vanes and rain gages. We have, however, to go to Korean writings in order definitely to establish the fact that rain gages were installed for the purpose of collecting rainfall data as early as 1442 A. D.,[8] two hundred years before Galileo's friend Benedetto Castelli introduced the use of the rain gage in the West. Dr. Wada, Director of the Korean Meteorological Service, acknowledged that the astronomical instruments of Korea were either imported from China or copied from Chinese models, but he believed that the rain gage is distinctly of Korean origin.

Magnetic Needle

During the International Meteorological Congress held at Chicago in 1893, Bertelli, an Italian meteorologist, asserted[9] that Christopher Columbus discovered the declination of the magnetic needle during his first transatlantic voyage. Evidences, however, tend to show that the Chinese had observed the fact of magnetic declination fully seven hundred years before Columbus. Alexander Wylie, a well-known sinologue, in his essay on the magnetic compass in China,[10] says:

> The priority of the Chinese in the use of the magnetic compass is now so generally acknowledged that any argument adduced to prove or illustrate it would be altogether

[6] *Abhandl. zur Geschichte der Math. Wiss. mit Einschluss ihrer Anwendungen, begründet von Moritz Cantor*, No. 30, p. 47, Leipzig, 1912.

[7] John Milne: Earthquakes and Other Earth Movements, London, 1886, p. 14. Milne apparently translated the passage from a Japanese book, and hence the discrepancy in the spelling of the name of the author.

[8] A. G. McAdie: The Principles of Aerography, Chicago, 1917, p. 207; *Japanese Meteorol. Mag.*, 1910, pp. 81-85; *Quart. Journ. Royal Meteorol. Soc.*, Vol. 37, 1911, pp. 83-86.

[9] Timotheus Bertelli: The Discovery of Magnetic Declination Made by Christopher Columbus, in "Report of the International Meteorological Congress, Held at Chicago, Ill., Aug. 21-24, 1893," *Weather Bur. Bull. No. 11*, Washington, D. C., 1894-96, pp. 486-492.

[10] Alexander Wylie: Chinese Researches, Shanghai, 1897, p. 155.

superfluous; . . . . . the fact that the declination of the magnetic needle was also known to them at an early date is now well understood. In Lih Seang Kaou Ching, which appeared at the end of the seventeenth century (Bk. 4, p. 2), it says, "The magnetic needle cannot be taken as a standard, for it is found to have a declination."

A passage from the life of Yih Hing, a Buddhist priest and imperial astronomer at the commencement of the eighth century, will show that the subject engaged the attention at least 900 years earlier. It is said "On comparing the needle with the north pole he found the former pointed between the constellations of Heu and Wei.[11] The pole was just six degrees from Heu, from which the needle declines to the right (east) 2° 95′′′.[12] Thus at the beginning of the eighth century the variation of the needle at Singan (capital of China at that time) was 2° 95′.[13]

Sun Spots

Although the relation between sun spots and weather was not suspected by the Chinese, yet, as pointed out by Hosie,[14] it is generally admitted that the Chinese were the first to discover the sun spots. The famous French astronomer and meteorologist Arago says:[15]

Dans les annales de la Chine du père Mailla, on lit qu'en l'an 321 de notre ère, il y avait sur le soleil des taches qui s'apercevaient à la simple vue. En prenant à la lettre les assertions du père Mailla . . . . . les titres des Chinois seraient de meilleur aloi.

Thermometers and Hygroscopes

Thermometers and hygroscopes were first introduced into China in the middle of the seventeenth century by Ferdinand Verbiest[16] (1623-1688), a disciple of Tycho Brahe (1546-1601). Verbiest entered China in the year 1659. From that year until his death he received numerous favors and honors from the Emperor Kan-Si. For several years he held the post of President of the Board of Mathematics and Astronomy.

The thermometer and the hygroscope, claimed by Verbiest as his own inventions, appear so novel and so different from the early instruments of the West, that it is not out of place to describe them here. In principle Verbiest's thermometer[17] resembles the air thermometer of Galileo and shares the defect of the latter in that it is also affected by the varying atmospheric pressure. As shown in the figure (Fig. 1) the instrument consists of a U-tube made of glass fitted into a wooden frame. One end of the tube is connected with a large bulb filled with air while the other end

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[11] The constellation Heu commences in Aquarius 19° 13′ 17″, and Wei in Aquarius 29° 11′ 13″.

[12] In the old Chinese reckoning, a degree is divided into 100 minutes, and a minute into 100 seconds.

[13] Timotheus Bertelli: La declinazione magnetica e la sua variazione nelle spazio scoperte da Cristoforo Colombo, Rome, 1892. He quotes many Chinese passages in French translation to prove that the early Chinese had really no knowledge of the magnetic declination. Apparently Bertelli was not aware of Yih-Hing's work.

[14] Alexander Hosie: Sunspots and Sun-Shadows Observed in China, B. C. 28–A. D. 1617, *Journ. North-China Branch Royal Asiatic Soc.*, N. S., Vol. 12, Shanghai, 1878, pp. 91-95.

[15] D. F. J. Arago: Astronomie populaire, Vol. 2, pp. 107-108, Paris, 1858.

[16] For further reference to Father Verbiest, see J. B. DuHalde: The General History of China, 4 vols., London, 1736 (translated from the French); reference in Vol. 3, pp. 86-110.

[17] Illustrations and descriptions of these two instruments appear in the Chinese Encyclopedia (Kua-Chiang-Tu-Shu Chi-Zung), a work instigated by the emperor Kan-Si (1662-1722) and published during the reign of his successor. A printed edition in 1628 volumes of about 200 pages each was issued at Shanghai in 1889. The illustration of the thermometer is reproduced below (Fig. 1).

is open, water being used to fill the lower portion of the tube. A scale is attached to each arm of the tube, graduated in ten degrees at unequal intervals which vary with the rate of expansion and contraction of the air. As explained by Verbiest, the instrument can be used to measure the atmospheric and ground temperatures, the temperature of the human body, and even the temperature of planets, moon, and stars. He seriously entertained the idea that if the thermometer were exposed to moonlight the gas in the bulb would be seen to contract, showing the low lunar temperature. He also stated that the physical vitality of persons could be tested by their merely rubbing the bulb for a minute or two.

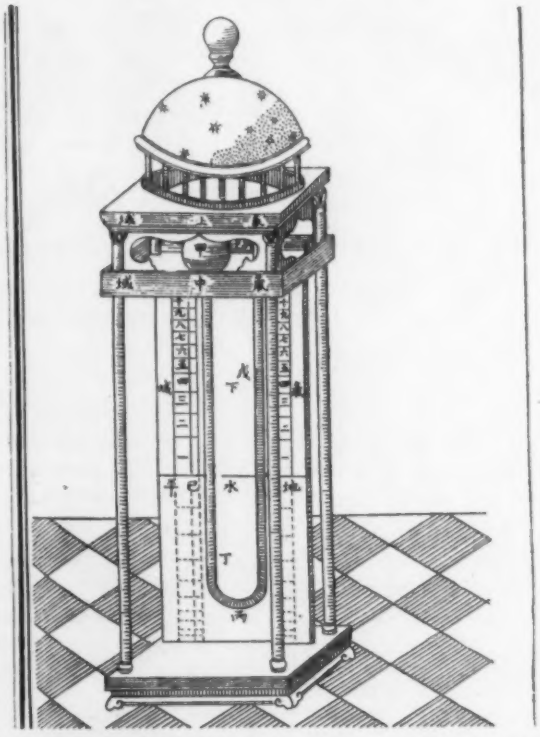

FIG. 1—Ferdinand Verbiest's thermometer of the second half of the seventeenth century. (Reproduced from Fig. 108 of the Chinese Encyclopedia.)

The two columns of figures on the scale are the Chinese numerals from 1 to 10, reading upward. The region below zero is supposed to represent the condition beneath the earth's crust, which, according to Verbiest, is extremely cold. The crown of the instrument with stars engraved on it is supposed to represent the condition in interstellar space, which is thought to be also very cold. The other Chinese characters are used to designate different parts of the instrument.

In common with the other hygroscopes of early times, Verbiest's instrument consists of the gut of an animal (a deer in this case), which expands and contracts as the moisture content of air increases or decreases. The deer gut in question is two Chinese feet[18] in length and one-tenth of an inch in thickness. It hangs in a wooden frame open on all sides. At the lower end of the gut a suitable weight is attached. A little above this an indicator in the form of a needle, decorated with dragons, is inserted in the gut with a scale just beneath it. When the moisture content of the air increases the indicator turns to the left, when it decreases the indicator turns to the right. The relative humidity of the atmosphere is thus roughly indicated.

[18] One Chinese foot = 1.05 English feet.

NEW EVIDENCE THAT COOK DID NOT REACH THE POLE

In the course of the Crocker Land Expedition, organized under the joint auspices of the American Museum of Natural History, the American Geographical Society, and the University of Illinois, whose recent return was referred to in these pages (October, 1917, *Review*, pp. 320-321), the services were secured of two Eskimos, E-took-a-shoo and Ah-pellah, who were with Dr. Frederick A. Cook on his expedition of 1907-09 and accompanied him on his alleged journey to the North Pole. Mr. Donald B. MacMillan, the leader of the expedition, took the opportunity to question them in detail regarding Dr. Cook's trip. The reliability of their report rests upon the remarkable development of the sense of location which is a characteristic of their race. This finds expression in their ability to reproduce with great fidelity the details of a journey and in their skill in reading and constructing maps. Numerous examples of Eskimo maps are known, notably those of Cumberland Sound and Frobisher Bay in the southeastern part of Baffin Island (Boas' "The Central Eskimo," *Sixth Annual Rept. Bur. of Amer. Ethnol. for 1884-85*) and of the central part of the eastern coast of Greenland (Holm's "East Greenland Expedition of 1883-85," *Meddelelser om Grönland*, Vols. 9-10). This report to Mr. MacMillan on Dr. Cook's journey is therefore not in the nature of loose testimony but a real contribution to the subject. The detailed evidence is embodied in a letter from Mr. MacMillan to the editor of the *Geographical Review*. The letter follows:

Boston, Mass., December 31, 1917.

To the Editor of the Geographical Review:

Dr. Cook with a single white companion, by the name of Francke, the cook of the fishing schooner *John R. Bradley*, was landed at Annoatok, some fifteen miles north of Etah, late in August, 1907. There were living here at this time about six families of the so-called Smith Sound tribe of Eskimos. This number was supplemented later by the arrival of several families from the south.

"Shortly after the sun returned" in February, the expedition left Annoatok, aiming west across Smith Sound for the head of Flagler Bay. Ascending the river valley Dr. Cook crossed over the heights of Ellesmere Island into Bay Fiord and on up Eureka Sound to the northern end of Axel Heiberg Island but did not reach Cape Thomas Hubbard, which is some five miles west, this accounting for his not finding Peary's cairn and record. Game was plentiful throughout the trip; the dogs and the men were well fed.

At this point a cache of food and a few small articles were left. Four Eskimos returned to Etah. Four Eskimos accompanied Dr. Cook during the first day's march on the Polar Sea, a march of about twelve miles. Upon the completion of the snow home, two Eskimos returned to land, leaving E-took-a-shoo and Ah-pellah ["E-tuk-i-shook" and "Ah-we-lah" in Dr. Cook's book] alone with Dr. Cook.

Dr. Cook and his two Eskimo boys did not proceed beyond this point, which is about 500 miles from the Pole. A flag was raised over the snow house and a picture taken.

For instruments Dr. Cook had with him a common watch, a compass, and a full sextant. The sledges were loaded with food.

After sleeping at this camp two nights, the party returned to the cache on the shores of Axel Heiberg Island, took everything from the cache, and proceeded south, following its western shore. Two low islands were discovered in about latitude 79°, very low and about five miles from land. The party crossed to the eastern shore of Amund Ringnes Island, where camp was made and one or two caribou were killed. Returning, they made camp a little east of Cape Southwest of Axel Heiberg Island. They now journeyed southeast to the shores of North Lincoln [southern part of Ellesmere Island], crossing the land into Gaase Fiord. Upon reaching the entrance they turned west, then north into the narrow channel known as Hell Gate. Here the small canvas boat was launched, one of the two sledges placed on board, and all dogs abandoned. The boat proceeded south, then east, following the southern shore of Jones Sound to Baffin Bay. Encountering heavy ice which barred their progress south, they returned west and landed at Cape Sparbo on the northern shore of North Devon. Here an old Eskimo igloo was prepared and furnished for the winter to come. Game was plentiful, and the igloo, well stocked with meat, was warm and comfortable.

Early in the spring of 1909 these three men packed their sledge and began their long walk back to Etah, the two Eskimo boys generally pulling the sledge and Dr. Cook pushing on the upstanders.

Between Cobourg Island and North Lincoln two uncharted islands were discovered. On the retreat northward the party followed a course well away from land, because of the depth of snow prevalent here in the spring of the year. Food gave out. All became very tired and very hungry. Finally a bear was secured, enabling the men to reach Cape Sabine. Here a seal was found in cache, placed there one year before by Panik-pa, the father of E-took-a-shoo. With renewed strength, thus acquired, the party succeeded in crossing Smith Sound to the headquarters of Dr. Cook at Annoatok. Following a few days' rest Dr. Cook proceeded south by dog team to Upernivik.

Many of the photographs in Dr. Cook's "My Attainment of the Pole," New York, 1911, are recognized by both E-took-a-shoo and Ah-pellah. The photographs facing page 244 marked "Bradley Land Discovered," etc., were taken off the western shore of Axel Heiberg Island, about 550 miles from the Pole.

Facing page 282: Photo "Mending Near the Pole" was taken on west side of Axel Heiberg Island.

Facing page 286: "At the Pole—'We were the only pulsating creatures in a dead world of ice.'" Photos taken in spring of 1909 near Cape Faraday on east coast of Ellesmere Island about 780 miles from the Pole. The musk-ox boots worn by Ah-pellah were made in the igloo at Cape Sparbo in Jones Sound, following Cook's return from the north.

Facing page 298: "First Camp at the Pole, April 21, 1908." Photo taken in spring of 1909 a little south of Cape Faraday on the eastern shores of Ellesmere Island.

Facing page 310: "With eager eyes we searched the dusky plains of crystal, but there was no land, no life, to relieve the purple run of death." Photo taken near Cape Faraday. Ah-pellah is wearing a musk-ox coat made at Cape Sparbo in Jones Sound.

Facing page 332: "Back to Land and Life." Taken near Cape Southwest, southern coast of Axel Heiberg Island.

Facing page 336: "Saved from starvation, the result of one of our last cartridges." Taken near Cape Svarten on the north shore of North Devon. The boys had many cartridges at this time. They had four, in fact, when they reached Etah.

Very truly yours,

DONALD B. MACMILLAN
Leader, Crocker Land Expedition

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Annual Reports of the Society; Meetings of January. The annual meeting of the American Geographical Society was held on Tuesday evening, January 22, at the Engineering Societies' Building, 29 West Thirty-ninth Street. The annual reports of the Council, of the Treasurer, and of the Special Committee were read, as follows:

Report of the Council

January 17, 1918.

To the Fellows of the American Geographical Society:

The activities of the Society during the past year are an indication of the progress made by it in the realization of its ideal of public service. In outlining these activities the following divisions may be considered: (1) special work in connection with the war, (2) Department of Exploration and Research, (3) the *Geographical Review*, (4) special publications, (5) lectures, and (6) library.

The first thought of every one has been in some connection with the Great War, and our organization has been no exception to the rule. It has been our good fortune to be able to be of material service by rendering available to the military forces of the country our collection of topographical and other maps, so that some fifteen hundred of them were used by the United States forces at their advent in France. We have also been employed by the Government to do some extended work which we are led to believe has been of much utility.

Communications abroad have been much interrupted but, nevertheless, we have maintained our exchanges with nearly four hundred foreign correspondents, so necessary to our program of affording the broadest possible field of information in the *Review*.

The most important single advance in the development of the Society has been the foundation of a Department of Exploration and Research. This work, which the Council have long aspired to attempt, has been rendered possible by the generosity of a valued Councilor. Funds have been secured for a broad program of work in 1918, to be described in detail in an early number of the *Review*. With the establishment of a definite program of research the Society has now an organization which will enable it to exercise the functions of a geographical institute, as the term is employed abroad.

The *Geographical Review*, which is the principal medium of the Society in communicating with its Fellows and with the outside world, has been maintained at a high level, and we have received many compliments upon our success in making the publication a judicious combination of scientific and popular geography. We have been able to present a large number of maps, prepared by our own staff, whenever essential to explain the text of any article, and we have had recourse somewhat more freely to half-tone illustrations in connection with the printed matter.

The second of a series of monographs, issued to members desiring it, was entitled "The Frontiers of Language and Nationality in Europe," by Leon Dominian, and the work appeared at an opportune time, as evidenced by the fact that it has been extensively quoted and referred to by writers upon the burning topics arising out of the European conflict. During the current year the Society expects to issue a striking book, exceptionally well illustrated, which will deal with the relation of physical geography to military strategy on the European battle fronts. There has also been prepared by a special emissary of the Society, sent to Petrograd for the purpose, a translation and review of the diaries kept by the mariner Bering during his Northwest voyages. This original matter will, it is thought, prove of interest.

The semi-monthly lectures, delivered in this city during the winter, were carefully selected and were largely attended by our local membership. Addresses were delivered by the following lecturers: Eric Mjöberg, William Curtis Farabee, B. R. Baumgardt, Arthur L. Day, J. Russell Smith, Theodore Roosevelt, George W. Goethals, LeRoy Jeffers, Donald B. MacMillan, and Theodoor de Booy.

Additions to the Library comprise 1283 books, 525 pamphlets, 828 periodicals, 36 atlases, and 1628 maps. Much progress has been made in continuing the binding of

unbound publications, rendering them much more convenient for reference. It is hoped that the ensuing year will witness the substantial completion of this labor.

At the official celebration of the opening of the Croton Aqueduct the Society was invited to participate and prepared an interesting exhibit of maps and historical material bearing upon the subject.

The number of Fellows at the date of this report is 3,586, of whom 381 are Life Fellows. The increase during the year numbers 799.

Four gold medals of the Society have been awarded, as follows:

The David Livingstone Centenary Medal to Theodore Roosevelt in recognition of his original work as an explorer in Brazil.

The Cullum Geographical Medal to Major-General George W. Goethals for his distinguished service to the nation and to the commercial world in connection with the construction of the Panama Canal.

The Charles P. Daly Medal to Professor George G. Chisholm for his contributions in creating a world-wide interest in the geographical basis of commerce.

The David Livingstone Medal to Manuel Vicente Ballivian, who, by the broad scholarship displayed in his own researches, by his efforts to secure government aid for geographical work, and by his encouragement of explorers, has done much for the promotion of geographical knowledge in Bolivia.

The *Annals of the Association of American Geographers*, published through this Society as heretofore, have been accepted as a valuable contribution to science and to teachers and students of geography.

The building of the Society has been open every day of the year with the exception of holidays for the accommodation of the public and for the exhibition of maps and other publications of interest in connection with passing events. The visitors who availed themselves of the opportunity to inspect or study the collections numbered 33,006.

The financial situation of the Society is excellent, as shown by the report of the Treasurer, of which a summary is annexed hereto, showing current revenues and expenditures. Generous gifts have been received from friends for special purposes, either in the conduct of specific undertakings or for the acquisition of designated properties. This general acknowledgment is all that is allowed by the generous donors.

The members of the staff have shown a most commendable spirit in meeting certain calls upon them arising out of the conditions heretofore alluded to. Their zeal and efficiency have been much appreciated.

Respectfully submitted on behalf of the Council

John Greenough
Chairman

REPORT OF THE TREASURER FOR 1917

The following is a statement of the income account and the condensed balance sheet of the Society as shown by the books on December 31, 1917:

Income Account

During the year there has been received for annual dues, interest on investments, and sales of publications	$55,819.61
There has been expended for salaries, house expenses, library, meetings, publications, postage, insurance, etc.	50,586.29
Carried to Balance Sheet	$5,233.32

Condensed Balance Sheet

Cash	$26,224.78	Capital uninvested	$3,691.22
Temporary investments	25,194.44	Sundry deposits	39,213.01
Sundry debits	63.33	Annual dues paid in advance	3,345.00
		Balance of income account	5,233.32
	$51,482.55		$51,482.55

Henry Parish
Treasurer

REPORT OF THE SPECIAL COMMITTEE

The Special Committee appointed December 20, 1917, to nominate and invite suitable persons to fill vacancies which will occur in the offices of the Society at the date of its

annual meeting in January, 1918, respectfully report that they recommend the election of the following gentlemen to the offices designated:

		TERM TO EXPIRE IN
President	John Greenough	1919
Vice-President	Anton A. Raven	1921
Foreign Corresponding Secretary	William Libbey	1921
Treasurer	Henry Parish	1919
Councilors	Banyer Clarkson	1921
	Edwin Swift Balch	1921
	W. Redmond Cross	1921
	Walter B. James, M.D.	1921
	H. Stuart Hotchkiss	1921

Hamilton Fish Kean
James B. Ford
Allison V. Armour } *Committee*

The reports of the Council and the Treasurer were approved and ordered on file. The persons recommended by the Special Committee for the offices to be filled received the unanimous vote of the Society and were declared duly elected.

President Greenough thereupon submitted for confirmation the names of 20 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society.

The lecture for the evening was entitled "Results of Several Journeys of Exploration in the Northwestern Amazon Basin," by Dr. Hamilton Rice. Dr. Rice took his hearers on an imaginary journey across the South American continent from Bogotá to the mouth of the Amazon, drawing mainly on the observations of his 1911-13 and 1916-17 trips. He described in detail his surveys of the Inirida, Içana, and Uaupés Rivers—surveys which have cleared up so much of the large unknown tract in the northwestern quadrant of the Amazon Basin. Dr. Rice briefly explained the methods used in making a reconnaissance survey such as he had undertaken, illustrating his words by lantern slides showing pages from his field notes, the taking of observations for latitude and longitude with a transit-theodolite, etc. The use of wireless telegraphy on his latest expedition, when communication with Arlington, Va., was easily maintained, was dwelt upon and the general use of this method in future exploratory work for the determination of longitudes predicted.

At an extra inter-monthly meeting on January 8 Mr. Henry Charles Woods, late British Vice-Consul at Adana, Asia Minor, addressed the Society on "The Bagdad Railway in the War." After outlining the course and present state of completion of the Bagdad Railway and its branches (see the maps in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, facing p. 936, and *Geogr. Rev.*, Vol. 1, 1916, facing p. 288) Mr. Woods described its strategic importance in the present war. The resistance of the Turks on the Mesopotamian and Palestine fronts, as well as their frustrated attack on the Suez Canal, were mainly made possible by the facilities for the movement of troops and supplies afforded by this artery. Since the recent opening of the Taurus and Amanus tunnels there is continuous rail connection between Constantinople and Nesibin, at least. The isolated section of the railroad from Bagdad to Samara, a distance of 75 miles, is now in British hands.

NORTH AMERICA

The Catskill Water System and the History of New York City's Water Supply. In the annals of hydraulic engineering the construction of New York City's new waterworks must surely rank as an epic undertaking. From Ashokan, the beautiful man-made lake in the Catskills, water is brought 120 miles to Staten Island, a journey taking almost three days. From a height of 500 feet on leaving the lake the water descends at the Storm King crossing of the Hudson to 1,100 feet below sea level; in its journey through the city it passes 18 miles through a tunnel cut in solid rock, the longest tunnel in the world, and on the final stage to the Staten Island reservoir the water is carried under the Narrows of the harbor. The formal opening of this great system in the fall of 1917 marked an event to which New York and its leading institutions justly paid tribute. To the commemoration the American Geographical Society contributed by the compilation of a "Selected List of Books and Maps Relating to the Water Supply of New York City" (pamphlet of 8 pp.). Among the permanent contributions of other bodies may be noted "The Water Supply of New York City: A Brief History of Its Development from the Earliest Days to the Present Time" (Appendix C, pp. 487-566, *22nd Annual Rept. Amer. Scenic and Historic Preservation Soc., 1917*, Albany, 1917). This historical summary outlines the water supply problem that has always been before New York since the

need arose for an artificial supply to supplement the natural resources of the abundant ponds, brooks, and springs.

The earliest artificial supply was provided by wells, but the structure of lower Manhattan Island is not favorable for such a source, the alluvial deposits overlying the rock bottom being readily permeated by the salty water of the Hudson and East Rivers. As the city grew and the need for prevention of fire increased, pumps, introduced in the first half of the eighteenth century, came into general use, and the water supply became a municipal affair. But the city began to outgrow the local resources. Serious epidemics of yellow fever and cholera during the later years of the eighteenth and the early nineteenth century emphasized the need for a revolution in the system of water supply. As early as 1798 the Bronx River was proposed as a source of supply, but the first effectual step towards the development of an exterior source may be dated at 1831, when the assertion was accepted that "the Croton River could be carried into the City of New York, and that without it a supply adequate to the present and future wants of the city could not be obtained." At this time the population of the city amounted to 200,000. Six years later work was commenced on the Croton Aqueduct, and by 1842 Croton water was being delivered. But in less than a decade the city population had advanced to over 500,000, and the storage capacity of the Croton system was insufficient to meet seasons of serious drought. The Central Park Reservoir was added, and, as the phenomenal growth of the city continued, other reservoirs followed. By 1893 the New Croton Aqueduct, with a capacity of 300,000,000 gallons per day, had commenced delivery to the population, now exceeding 1,500,000.

Extension of the Croton system continued, until by 1911 a stage had been reached beyond which further development was economically impossible. New York, now growing at the rate of about 175,000 persons a year, must look still farther afield for sources of supply. For physical reasons and reasons of state policy selection rested with the Catskills, a region of sparse population with a topography favoring heavy run-off and satisfying storage needs (cf. C. P. Berkey: Geology of the New York City (Catskill) Aqueduct, *New York State Museum Bull. 146*, Albany, 1911; *idem:* The Catskill Water Supply for New York City, *Journ. of Geogr.*, Vol. 10, 1911-12, pp. 231-237; and Thaddeus Merriman: Rainfall and Run-off of the Catskill Mountain Region, *Monthly Weather Rev.*, Vol. 35, 1907, pp. 109-118). In the Catskills watersheds aggregating over 900 square miles and affording a capacity estimated at 760,000,000 gallons per day have been acquired. At present only one section, the Esopus watershed, with its reservoir of Ashokan, has been developed. East of the Hudson and 30 miles north of the city (City Hall) has also been built a storage and emergency reservoir (Kensico). The magnitude of this part of the undertaking may be gaged from the fact that an army of 4,500 men was employed on the building of these two great reservoirs alone. Further development will be prosecuted as needs arise, and thus, for some few years at least, the water requirements of the city are assured.

Recent Growth of the Fur Trade in the United States. The fur trade of the United States is one of the country's businesses that have been greatly modified by the war. In pre-war years the trade was dependent in considerable measure upon Europe, both in manufacturing and sales: for dyeing and finishing upon the great fur industry of Leipzig; on London and to a less extent on the Russian fairs for the fur sales. In 1915 the first plant for dyeing and finishing the Alaskan seal skins was opened in St. Louis; it has been highly successful. In 1915 the same city held the first public auction of Government seal skins, since when regular auctions have been held there and in New York. The amount realized at the New York and St. Louis sales in October last was over $5,000,000 (J. C. Austrian: The United States as a Fur Market, *Dun's Rev.: Internatl. Edit.*, Dec., 1917). While the import of foreign undressed and manufactured furs has remained greatly diminished (1916), the imports of dressed furs has practically recovered, but with a noteworthy change of origin (*Commerce Repts.*, Nov. 15, 1916, pp. 617-619). The loss occasioned by the removal of Germany from the fur market has been made up by increased imports from Great Britain, Canada, France, Australia, and Argentina. The gain by the two last-named is particularly interesting. From an insignificant figure in 1913 the Argentine import suddenly jumped to over $1,000,000 out of a total of $17,000,000. It is this market that is supplying the greater part of the present popular nutria fur. The import from Australia, also greatly increased, is composed in part of rabbit skins, a substitute for those heretofore coming from Germany, Belgium, and France.

Peat, An Unutilized Resource of Minnesota. A glance at the agricultural maps of Minnesota in the "Minnesota Number" of the *Journal of Geography* (Feb., 1916) suggests the differentiation of the state into two economic areas, an agriculturally de-

veloped south and west and an agriculturally undeveloped northeast, the area of the large-sized countries. The latter is the region of coniferous forest, and it is the forest alone that has provided the single vegetal resource exploited commercially, though it is not the only one in prospect. For northern Minnesota possesses an untouched heritage from the Ice Age—peat deposits, among the largest and deepest on the continent. The glacial topography, with its gently undulating belts of drift and its quondam lake flats, has provided an ideal surface for peat accumulation, to which the still considerable water surface adds favorably humid atmospheric conditions. It is estimated that over 5,000,000 acres in the state are covered with peat to a depth of at least five feet, the minimum workable depth (E. K. Soper: The Peat Deposits of Minnesota, *Econ. Geol.*, Sept., 1917), and the largest and best lie on the unproductive surface of the northeastern area. How to make these deposits commercially profitable is still an unsolved problem. Peat has been used most generally as a fuel, but its calorific value is low, inferior to that of lignite; and as a fuel it has only been used to advantage in regions where superior fuels are lacking, as in Scandinavia, or are undeveloped, as in Russia, where 4,000,000 tons of peat are produced annually (Louis Renié: L'industrie de la tourbe, *La Nature*, May 26, 1917). Though possibilities of a machine peat industry for domestic fuel are not wanting, a greater future would seem to lie in the utilization of peat for power production. Peat producer-gas plants have proved successful for such a purpose in Europe. Further, the process affords a valuable by-product, ammonium sulphate, esteemed as a fertilizer for its high content of nitrogen. In relation to this scheme the great iron-mining areas of northeastern Minnesota have an important bearing. Besides minor industrial uses there also exists the possibility of using large tracts of shallow peat land for agriculture, a purpose which, again, would be highly advantageous to the industrial sections of this part of the state.

SOUTH AMERICA

The Chilean-Argentine Boundary in Beagle Channel, Tierra del Fuego. Two diminutive islands, almost unknown to geographers, navigators, or traders, have brought up a new boundary discussion between Chile and Argentina. As the value of islands does not depend upon their area (witness Manhattan and Heligoland), the question of ownership may be important even in remote Tierra del Fuego. The dispute concerns the islands of Picton and New, situated near the entrance to Beagle Channel. By a treaty of 1881 the boundary was to follow the meridian of Cape Espiritu Santo until it reached Beagle Channel. From there it turned eastward along the Channel, the islands on the south being recognized as Chilean. In the following years maps of both countries assigned all the southern islands to Chile, but in 1891 Argentine explorers decided that Beagle Channel had been wrongly represented and that Moat Bay, the eastern of two channels into which it may be considered here to be divided by Picton Island and New Island, does not constitute its eastern entrance. This would leave the ownership of the islands uncertain. The matter really hinges on the question as to whether magnetic or astronomic north was meant by the discoverers of the Channel. Captains Fitz-Roy and King, who commanded the English expeditions of 1826-36, and Darwin, who accompanied the second expedition, state that the entrance to Beagle Channel lies *north of Lennox Island*, an island that lies athwart the western channel and subdivides it again into two branches (for relative locations see map in *Geogr. Rev.*, Vol. 3, 1917, p. 177). The magnetic declination then averaged 24° east in that region. Chart No. 2207 of the U. S. Hydrographic Office gives 16° 35′ as the declination for 1915, with a yearly decrease of 5′. Hence the doubt as to the location of various points. Even the statement that Beagle Channel runs almost directly east and west and is about 120 miles long does not clear the matter entirely, since the western entrance is formed of two unequal arms.

The islands in question are inhabited only by a few Indians (see C. W. Furlong's description of the Fuegian tribes and their environment, *Geogr. Rev.*, Vol. 3, 1917, pp. 1-15 and 169-187). White settlements have been attempted at various times but without success. The natural resources are meager, consisting of a small amount of timber and some fair grazing land. It was upon the Tierra del Fuego coast near here that Allen Gardiner and his party of English missionaries starved to death in 1850. The chill winds of the Antarctic alternate with western storms, and 65 per cent of the days are cloudy (Walter G. Davis: Climate of the Argentine Republic, Argentine Meteorological Office, Buenos Aires, 1910). It is possible but not probable that the islands may come to have strategic importance.

The Argentine position has been presented in the "Derrotero del Canal de Beagle" published by the Sección Hidrográfica del Ministerio de Marina (Buenos Aires, 1901), in the "Memoria de los trabajos efectuados en el Canal Beagle, 1899-1900," by the same department (Buenos Aires, 1912), and in a series of editorials in *La Prensa* of Buenos

Aires in January and February, 1915, by Dr. Estanislao S. Zeballos. Chile's claim is defended by J. Guillermo Guerra, professor of international law in the University of Chile ("La soberanía chilena en las islas al sur del Canal Beagle," Santiago, 1917). The three volumes "Narrative of the Surveying Voyages of His Majesty's Ships *Adventure* and *Beagle*" (London, 1839) prepared by King, Fitz-Roy, and Darwin give a full description of Beagle Channel and adjoining lands. The character of the islands New and Picton is described at length in "Tierra del Fuego" by W. Parker Snow (London, 1857). Colonel Holdich in his "Countries of the King's Award" (London, 1904) devotes a chapter to this region, painting some charming word pictures of the scenery. The maps printed in the two countries afford interesting comparisons. The mere fact that the dispute has arisen shows that the development of South America is drawing attention even to the most remote corners of the continent.

British Guiana as an Exporter of Rice. To the credit of British Guiana stands a rapid development in cereal production. At the close of the last century the colony, almost wholly dependent on its sugar industry, imported annually about 40,000,000 pounds of rice. Today, while sugar is still the mainstay of the colony—forming 70 per cent of the export—rice cultivation has attained a stage where the product figures as an economically important export: in 1916 over 29,000,000 tons were shipped from British Guiana to the West Indies and the neighboring French and Dutch colonies. There is much in favor of this development. The abandoned sugar plantations of the flat coast lands, empoldered and easily irrigated, provide the right physical conditions. The East Indian who forms so large an element of the population is a cultivator trained by generations of labor in the rice field, and the hand work which he cannot supply should be replaced by mechanical devices (*Suppl. to Commerce Rcpts. No. 44a*, Oct. 29, 1917, and *Dun's Rev.: Internatl. Edit.*, Nov. 1917, p. 56).

EUROPE

Friuli, the Eastern Gate of the North Italian Plain. The plain, at least the comparatively small plain, is a feature suggesting geographical uniformity, and it is surprising to hear of the distinction of the North Italian plain into no less than 27 anthropogeographic types (Arrigo Lorenzi: Studi sui tipi antropogeografici della pianura padana, *Riv. Geogr. Ital.*, Vol. 21, 1914, pp. 269-354, 402-450, 497-530, 576-604). Analyzing the bases of this diversity E. Bénévent finds the most powerful determinant to lie in the hydrologic conditions of the plain (La plaine du Po: Étude de géographie humaine d'après le livre de M. Arrigo Lorenzi, *Rec. des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, No. 2, 1916, Grenoble).

North of the Po these hydrologic conditions divide the plain into three well-marked belts. On the Alpine borders coarse deposits at the heads of the alluvial fans are distinguished by their porosity and consequent aridity, an aridity made yet more pronounced by the dry summers. The streams, moreover, cut across the fans in channels too deep-sunk to permit the use of their waters for irrigation. Towards the base of the alluvial fans the rain water, sucked up by the greedy gravels higher up, reappears as a line of springs, and the streams, here graded, also offer water for irrigation. Below this second most-favored zone is a belt suffering from excess of water; the streams are raising their beds on natural levees, and drainage is the chief consideration. By proper provision for irrigation or drainage the second and third zones are susceptible of improvement towards great productivity, but under primitive cultivation distinction between the three zones is not great. While political instability existed such essentially co-operative works as those of irrigation and drainage could not be undertaken, but when the revolution of the nineteenth century brought peace and established order rapid progress appeared in the second and third zones, varying in degree with details of hydrography and soil. Today there are wide differences where fifty years ago modes of life had much in common. It is a far cry from the Piedmont rice farms, whose vastness recalls the Brazilian *fazenda*, or the equally great establishments of the dyked lands in the Po delta, to the primitive communal cultivation of the dry Piedmont foothills or the barren *magredi* of Friuli.

Of all the provinces of the plain Friuli is perhaps the most interesting. Here the greatest diversity of factors comes into operation (see also Raoul Blanchard: Le Front Italien, *Revue de Paris*, Sept. 15, 1915). As the eastern portal of the North Italian plain Friuli has always been a province apart, a transition zone geographically, a frontier zone politically. The geographic change is not sharp. Differentiation indeed commences east of the Adige, where begins the amphitheater of wild Venetian Pre-Alps, giving source to a drainage system distinct from that of the Po basin. Here are no glacier-fed, lake-regulated streams, but a local system of irregular torrents. In Venetia proper the cal-

careous plateau intervening between the heights and the plain serves to some extent as a means of control, but beyond the Piave the rude mountains frown directly down on the lowland. Here, too, heavier spring and autumn rains combine with the more rapid run-off to heighten the torrential nature of the streams. The volume of the Tagliamento where it debouches on the plain has been known to increase in a day or two from 40 to 9,000 cubic meters. In their recent advance across the plain of Friuli the Austro-Germans were favored by comparatively light rains and a low state of the rivers. A characteristic sudden rise would at least have delayed the rapidity of their movement. In sympathy with this stream regimen the alluvial fans of western Friuli attain a great areal development and a maximum of porosity and aridity; in places water is not to be found at depths of 100 meters. The country is steppe; wide spaces provide only scant pasture; cultivation is found only near the villages aligned along the mountain torrents. Property here is still held communally. Farther east, around Udine and Gorizia, conditions ameliorate, the soil becomes less permeable and more fertile and rains more abundant. Villages are smaller—for water is better distributed—but much more numerous. With irrigation much might be done; as yet it is scarcely attempted: the region is in a frontier zone of insecurity. Everywhere frontier characteristics are exhibited, from the dialect bizarre with its words of Slav origin to the walled villages bespeaking the ancient fear of the invader. And if progress in the higher zones is retarded, still more so is it in the sea borders. About the Piave drainage has made rich lands available for cultivation—the lands now flooded for the defence of Venice, but between the Tagliamento and the Isonzo vast marshes bordering the lagoon remain in their primitive condition. They are desolate wastes, cutting off the hinterland from access to the sea. The backwardness of Friuli has an historical as well as a physical basis.

AFRICA

The Uganda Railroad in the Development of East Africa. During the years immediately following the partition of Africa (1884) our rapidly increasing knowledge of the central regions made patent the extent and influence of the slave trade, whose horrors had been first revealed by Livingstone. Need for the suppression of this shameful traffic led to the Brussels Conference (1890), wherein among the measures recommended was development by the interested Powers of means of communication, especially railroads in the respective territories. As a matter of national duty and political expediency Great Britain complied with the obligation of the conference by building the Uganda Railroad through her East African sphere of influence. The result might be described as magical: the line not only fulfilled the humanitarian and strategic expectations; it "literally created a country." Today the Uganda line remains the dominant influence of British East Africa, and its economic sphere extends far over Uganda and over a part of German East Africa. As may be anticipated the annual *Administration Report of the Railways of East Africa and Uganda* is a document of great geographical interest, and this is particularly so in the case of the current report, for the year 1916-17 (Nairobi, 1917), wherein war conditions have tested out the merits of the line. Discounting the invaluable military services of the line in the German East African campaign and eliminating the figures of traffic accruing from this source, the prosperity of the line in wartime remains significant, as the following table shows (values given in round numbers in rupees):

Year	*Up Traffic*	*Down Traffic*
1910-11	1,790,000	770,000
1913-14	3,860,000	1,420,000
1914-15	2,470,000	1,000,000
1915-16	2,390,000	1,000,000
1916-17	2,940,000	1,380,000

During the three years of the war no traffic came from the German possession, which has normally accounted for about one-fifth of the total. Including revenues from military transport the net earnings of the Uganda line have steadily increased from the small credit of the second year of operation (1904-05) to a gain of about $1,750,000 in 1916-17.

The prospects for future expansion are two-fold. Cotton and coffee cultivation, upon which the line is chiefly dependent, will expand and with their expansion the status of native civilization will also increase, swelling the import as well as the export trade. Another prospect lies in the progress of white colonization. The highlands of British East Africa constitute the most extensive area in equatorial Africa where the white man can look for a permanent home. The possibilities of the highlands have long been recognized or at least suspected. They have been the site of visionary colonization projects;

but definite proof of their suitability for white colonization also exists, as the Boer families established on the Uasin Gishu plateau east of Mt. Elgon attest. The latest project, recorded in *United Empire* for September, 1917 (H. R. Tate: British East Africa), aims at establishing on the land soldiers of European extraction who have served in the present war in East Africa or elsewhere. Success of such a scheme would appear, however, to be largely dependent on the facilitation of communication. Of especial importance, then, in this regard is the survey by the railroad administration for a line over the Uasin Gishu plateau. The proposed road will probably constitute a portion of a future trunk line to Uganda and the Congo and apparently would serve one of the three chief districts designated for the proposed colonization.

One other item of the report merits attention at this time when the future of colonial administration is in the balance. The native problem is the crux of the question. Its solution must be largely determined by the estimate of the native's capacity for civilization. Twenty years ago the native of British East Africa—as distinct from Uganda—was considered hopeless and useless. "Native labor is of little value, no dependence can be placed upon it, and even famine fails to force the tribes to seek work." Today that opinion has been changed to a belief that, trained and educated, the native can supply labor skilled as well as unskilled for all the manufacturing and industrial enterprises of the protectorate. The railroad provides an example of remarkable progress in industrial education in the 9,000 Africans working upon it.

A New Abyssinian Potash Deposit. The economic factor, especially in its aspect of mineral wealth, has been one of the most provocative factors in the precipitation of boundary disputes. The Alsace-Lorraine question has its economic side based on the iron deposits of the frontier-zone. The Chilo-Peruvian War of 1879-83 for possession of the nitrate fields is a notorious example. Even Central Africa, whose mineral resources are so little known, has been vexed by this question. Recognition of the value of the Katwe salt deposits on the Congo-Uganda boundary led to a reinvestigation of the original delimitation and a necessity for fixing the "wandering" meridian of 30° E. A later case is that arising from the discovery of that rare natural deposit, soluble salts of potash, in the undelimited frontier region between Eritrea and Abyssinia, some 50 miles inland from the hitherto insignificant Red Sea port of Fatimari (15° S. and 40¼° E.). The mineral, at first thought to be in Italian territory, is now for the time being conceded to lie in Abyssinia (*Commerce Repts.*, July 20, 1917). The discovery was made in 1911, but as the locality is a barren waterless district far from any established port, little interest was aroused. At that time the only deposits in course of commercial exploitation were those of Strassfurt and the newly opened mines of Mülhausen, the world monopoly thus being in the hands of Germany. When the war removed Germany from the potash market exploitation of the African deposit was hurriedly commenced. A good deal of potash has already been shipped on camel back to the coast and a railroad and port are in the course of construction.

The deposit differs from those of Alsace and Catalonia (still undeveloped), which are of Tertiary age, and that of Stassfurt, which is Permian, in that it is of recent formation. the product of evaporation from a former arm of the sea in a depression pertaining to the great rift system of East Africa (P. Sallior: Gisements de potasse nouveaux, *La Nature*, Nov. 24, 1917, summarized by T. E. Thorpe under "Sources of Potash," *Nature*, Jan. 3, 1918).

ASIA

The Punjab Irrigation System. The modification of the earth's surface and the turning to man's benefit of conditions naturally unfavorable is nowhere more marked than in irrigation development. The engineer, or literally "ingenious man," has before him the problem of co-operating with nature in a vast creative enterprise and in perfecting details which, from the human standpoint, have been left unfinished. It has been reserved for recent years and for modern ingenuity to bring to a high degree of development the distribution of water to dry lands which nature has been perfecting for thousands of years and human agencies for hundreds.

Perhaps the most notable instance in modern engineering of the utilization of geographical knowledge, including that of ancient times, is to be found in the Punjab region of India, the land known in the native tongue as the "Panj (five) ab (water or rivers)" (Sir John Benton: The Punjab Triple Canal System, *Minutes of Proc. of Inst. of Civil Engineers, London*, Vol. 201, Session 1915-16, Part I, 52 pp.; abstracted in *Engineering* (London), Nov. 19, 1915, p. 515). These five rivers flow southwesterly from the Himalayas and unite to form the mighty Indus. Before they join they flow through a rich

alluvial country which is capable of supporting in comfort a much larger population than now exists if only one missing necessity can be supplied, and that is water. Because of the difference in their catchment areas the rivers are dissimilar in size and in regularity of flow. The larger and more dependable streams are so located that their waters can not readily be diverted to the neighboring lands, while the smaller streams, more easily controlled by the engineer, have been overcapitalized, as it were, that is, gravity canals have been built from them commanding areas larger than can be supplied. To rectify this condition, the British engineers in India have made extensive studies of the topography of the irrigable areas and have finally built large supply canals which enable the transfer of water from west to east, from the rivers where there is an abundance to those where it is deficient.

On the east of the central Punjab is a tract of more than 1,500,000 acres of fertile land which has been lying idle for want of water and which can not be supplied from any source near it, because the perennial supply from the nearer streams, the Sutlej, Ravi, and Chenab, had already been fully utilized. At the same time only about a quarter of the perennial flow carried by the more western stream, the Jhelum, had been diverted, the remainder flowing useless to the sea. The suggestion was made that this surplus should be diverted to the east for the irrigation of the dry fertile land. To do so necessitated the crossing of two of the eastern rivers, namely, the Chenab and the Rabi, and also of numerous and formidable hill torrents.

The project of taking the excess water easterly has finally been carried out by the construction of three separate but interconnecting canals. The first, known as the Upper Jhelum Canal, with a capacity of 8,500 cubic feet per second, takes water from the river of that name, carrying it southerly across the divide to the Chenab River. From this stream there had already been built what is known as the Lower Chenab Canal, which took out most of the available supply. This canal is sufficiently far down on the river to receive the water brought over by the Upper Jhelum Canal. Above the Lower Chenab Canal is a vast extent of excellent land which could not be reached by the older works. Another canal, therefore, the Upper Chenab Canal, the second in the series above noted, was built, with capacity at the head of 11,700 second-feet, to utilize the natural flow of the Chenab River. In so doing it would deprive the older Lower Chenab Canal of needed water were it not for the supply brought into the Chenab River by the Upper Jhelum Canal, which brings in as much water as the new Upper Chenab Canal takes out above.

The quantity received by the Upper Chenab Canal is such as to permit a certain amount to be carried through the system and to escape into the Rabi River. At this point there is a dam or barrage across the channel, and the third important canal, known as the Lower Bari Doab Canal, takes off a volume of 6,750 cubic feet per second.

Thus, by this system of three canals it has been possible to divert waters across a rough country from the largest stream on the west and to increase the flow in a smaller river, from which water is taken at a higher elevation and in an equivalent amount, to be transported across another natural divide into the third stream, from which in turn another canal takes off. The total length of these canals and their branches and distributing systems to the farms is nearly 23,000 miles.

The average rainfall is from 25 inches near the mountains to 10 inches out on the lower plains. In dry years the precipitation is about one-half this amount. Irrigation is carried on throughout the year, this being divided into two seasons, the cold, from October to March, and the hot, from April to September, when the rivers are flooded and when nearly 90 per cent of the annual rainfall occurs. During this time what is known as the *karif* crop is obtained. The cold half of the year, embracing the winter months, produces what is known as the *rabi* crop. The duty of water, that is to say, the number of acres irrigated by one cubic foot of water per second, is during the hot season about 100 acres and during the cold months 200 acres.

The lands are divided on the basis of about 25 acres to a family, and the annual charge for water is from $1.50 to $1.75 per acre. Out of a total irrigable area of approximately 4,000,000 acres one-half is irrigated by this system. It has not been considered wise to attempt to water a larger proportion at present because of the fact that under existing conditions there is a deficiency of fertilizers, there being little if any manure in the country. With the native system of agriculture the only successful way of renewing the soil is by alternate periods of cultivation and fallowing. The danger of waterlogging the soil is also reduced by irrigating only a portion of the tract.

The total investment has been about $30,000,000, and on this amount the completed works will return an interest of 8 per cent or over. In addition much financial benefit will accrue from increased returns to the railroads and other industries, so that the annual gains may be placed, possibly, at 15 per cent, in addition to the increased prosperity of the people who are transforming a drought-stricken famine country into one of the most highly productive portions of the earth. F. H. NEWELL.

PHYSICAL GEOGRAPHY

Rainfall and Battles. The widespread popular notion that gunfire produces rain will not die. It has come very prominently to the front again since the war began. In spite of all that scientific writers have done and are doing to overthrow this belief, the superstition, or prejudice, still persists. Recently, M. Alfred Angot, Director of the Bureau Central Météorologique de France, has presented the facts in the case clearly and authoritatively (*Comptes Rendus de l'Acad. d'Agric.*, No. 18, 1917, 3, pp. 501-508). Mixture of warm and cold air masses, as the result of explosions, might cause cloud formation or even a slight drizzle but never any considerable precipitation. Water vapor resulting from chemical reaction could not be a source of precipitation. An enormous amount of explosives would be required to produce even a small rainfall, and even then all the hydrogen in the explosive would have to become water vapor and condense at once (21,750 tons of melinite per square mile, to give 1 millimeter). Electrical action, resulting from the ionization produced by high explosives, and an excessive number of dust particles arising from the same source can do "no more than accelerate a precipitation which would be necessitated sooner or later by the progressive cooling of the air." A careful study of the amounts and the frequency of rainfall in France since the war began fails to show any effects of the gunfiring. R. DEC. WARD

Can Seasonal Weather Forecasts Be Made from Ocean Water Movements? Seasonal weather forecasts can be made if the answers to these two questions are satisfactory: (1) How closely do ocean surface temperatures control the weather? and (2) To what extent is it possible to forecast the distribution of water-surface temperature departures over the oceans?

How can these be answered? Ocean temperatures directly affect the weather of leeward shores; and indirectly through modifications of pressure distribution they may control the weather far from the coast. The value of ocean temperatures for seasonal forecasts can, therefore, be determined (1) by direct comparison of weather with the water temperatures at the same time; and (2) by making classifications of types of water temperature distribution for each of the twelve months and then finding the similarities of the pressure distributions accompanying each occurrence of each type. With the typical pressure distributions which may be found connected with the types of water temperature distribution, the weather to be expected over wide areas can be easily determined.

Ocean currents and drifts have been observed so long that we know their general directions and rates of movement, in some cases even by months. Marked temperature departures must move in the waters in which they occur, though their identities may soon be lost through the great mixing of oceanic surface waters. In spite of mixing, however, more than a chance correlation is to be expected between great temperature departures in a current and those occurring even a year later thousands of miles away in the direction toward which the current flows. And if one makes combinations of temperature departures in the major currents which take part in the water flow to a distant area, the result may be found to approximate closely the temperatures as observed.

The tentative results already obtained from meager data seem to justify a thorough investigation of the temperature movements of ocean surface waters and their relation to the weather of the neighboring or even of distant continents. CHARLES F. BROOKS

GEOGRAPHICAL NEWS

Officers of the Association of American Geographers for 1918. The following officers have been elected by the Association of American Geographers for 1918:

President, Nevin M. Fenneman; *First Vice-President*, Charles R. Dryer; *Second Vice-President*, Bailey Willis; *Secretary*, Oliver L. Fassig; *Councilor*, Walter S. Tower; *Treasurer*, François E. Matthes.

PERSONAL

DR. W. C. FARABEE gave a lecture on his recent expedition under the title "Exploration in the Valley of the Amazon" before the Geographic Society of Chicago on December 14, 1917.

DR. ALEŠ HRDLIČKA, Curator of Physical Anthropology of the U. S. National Museum, addressed the Anthropological Society of Washington on October 2, 1917, on "Bohemia and the Bohemians."

PROFESSOR D. W. JOHNSON of Columbia University read a paper entitled "The Physiography of the Italian Front" before the New York Academy of Sciences on January 21.

MR. DONALD B. MACMILLAN, leader of the Crocker Land Expedition, gave a lecture before the Geographical Society of Philadelphia on December 5, 1917, on the activities of the expedition in the Arctic, entitled "In Search of New Arctic Lands."

MR. P. LEE PHILLIPS, Chief of the Division of Maps of the Library of Congress, is collecting data about Bernard Romans, 1720(?)-1784, author of the "Concise History of East and West Florida," for the purpose of reproducing his map of Florida, 1774, the only known copy of which is in the Library of Congress. Mr. Phillips desires to locate Romans' works, including other maps he compiled, and to find out the whereabouts of his manuscripts, especially the diary which he is supposed to have left. Any information on this matter would be gratefully received by Mr. Phillips. Ultimately a facsimile reproduction of the Romans map of Florida may be published similar to that of Filson's "Map of Kentucke," 1784, published by W. H. Loudermilk & Co. of Washington, D. C., under the editorship of Mr. Phillips.

DR. E. L. STEVENSON of the Hispanic Society of America gave a series of five lectures on "New World Cartography" at the University of California during November. The titles and dates were as follows: "Medieval Geography: The Heritage from Antiquity and the Contribution to Earth Knowledge in the Pre-Renaissance Period," November 21; "The Expansion of Geographical Knowledge in the Early Renaissance Period: Overland Exploration and Discovery in Regions beyond Europe, and the Beginnings of Trans-Oceanic Expansion," November 22; "The Earliest Explorations and Discoveries in the New World: Conceptions of the Geography of the Newly Found Regions, and the Record As Left by the Contemporary Map Makers," November 23; "The Progress of Discovery As Recorded in the Spanish and the Spanish-Italian Maps: The First Half-Century of New World Geography," November 26; "The Mapping of French and English Explorations in the New World," November 27.

DR. GRIFFITH TAYLOR of the Australian Commonwealth Bureau of Meteorology was awarded the gold medal of the Royal Geographical Society of Queensland at Melbourne on November 9, 1917. The award was made for a paper on the settlement of tropical Australia. The paper deals especially with the control of vegetation and settlement by temperature and rainfall and is related to the general line of research to which Dr. Taylor has been devoting himself since his return from the Antarctic, the published results of which have been discussed in the *Review* for May 1916, p. 396, Nov. 1917, pp. 401-403, and Jan. 1918, pp. 77 and 86. The paper, which is accompanied by numerous original maps and diagrams, will be published in 1918 by the Queensland Branch of the Royal Geographical Society of Australasia, Brisbane.

MR. NORMAN TAYLOR is giving a course on phytogeography at the Brooklyn Botanic Garden.

MR. H. CHARLES WOODS, who lectured before this Society on January 8, delivered his lecture on "The Bagdad Railway in the War" before the Geographical Society of Philadelphia on January 18.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

ALASKA

PARKER, G. H. **The fur-seals of the Pribilof Islands.** Maps, ills. *Scientific Monthly*, Vol. 4, 1917, No. 5, pp. 385-409.

In this clear account of the fur seals of the Pribilof Islands Professor H. G. Parker emphasizes not only the financial gain which the United States has already received from these animals but the prospect of a large and continuous revenue from them for an indefinite future. Thus the amount of legislation and controversy which the seals have occasioned is justified by their importance. Three herds of fur seals breed in the North Pacific. The smaller herd is under the care of Japan, the next, which breed on the Commander Islands west of the Aleutian chain, is controlled by Russia, but by far the largest herd is that which breeds on the Pribilof Islands under the management of the United States. The breeding season is the one time of year when careful observations can be made of the fur seal's habits. In the spring the mature males repair to certain spots on the beach to await the coming of the females. By the middle of June the latter begin to arrive. Within a few days of her arrival the female gives birth to a single "pup" and shortly after is impregnated by the bull. It is calculated therefore that the period during which the young are carried must be a year less about a week. Since each male, or bull, maintains a harem of about forty females, it is obvious that there must be an excess of males. These form a disturbing element which can be removed without loss to the herd. Their pelts are in the most marketable condition at three years. Professor Parker therefore recommends that a certain part; calculated at 8 per cent, of the three-year-old bachelors be retained and the others be killed. The present law forbids the killing of these males until after the season of 1917 and then an annual reserve is to be made of not fewer than 5,000, evidently a less scientific arrangement than that of reserving a certain percentage of the herd. Killing in the open sea, now suspended by treaty between the United States, Great Britain, Russia, and Japan, is utterly condemned. In pelagic sealing great numbers of females are killed whose pups die subsequently of starvation. The bodies of many of those killed at sea are lost. From these causes an enormous waste occurs without any corresponding benefit. R. H. JONES

—— **Alaska, Report on the work of the Bureau of Education for the natives of, 1914-15.** 85 pp.; map, ills. *Bur. of Education Bull., 1916, No. 47.* Dept. of the Interior, Washington, D. C., 1917. [The sections on the reindeer service are referred to in a note in the July *Review*, Vol. 4, 1917, p. 55. See also previous report, *Geogr. Rev.*, Vol. 1, 1916, p. 228.]

—— **Alaska (United States Coast Pilot). Part II: Yakutat Bay to Arctic Ocean.** 303 pp.; index. *U. S. Coast and Geodetic Survey Serial No. 34.* Washington, D. C., 1916.

—— **Alaska's New Railway.** Ills. *Natl. Geogr. Mag.*, Vol. 28, 1915, No. 6, pp. 567-589.

ANDREWS, C. L. **Alaska under the Russians: Baranof, the builder.** *Washington Hist. Quart.*, Vol. 7, 1916, No. 3, pp. 202-216.

ANDREWS, C. L. **Alaska under the Russians: Industry, trade, and social life.** *Washington Hist. Quart.*, Vol. 7, 1916, No. 4, pp. 278-295.

AUER, H. A. **Camp fires in the Yukon.** x and 204 pp.; maps, ills. Stewart & Kidd Co., Cincinnati, 1916. $1.75. 8½ x 5½. [A record of "the writer's experiences and observations as a hunter of big game in the Yukon just as they happened day by day and set down in my [his] diary at the time the events narrated transpired." The route lay from the end of the railroad at Whitehorse west along the landward side of the St. Elias Range.]

BROOKS, A. H., AND OTHERS. **Mineral resources of Alaska: Report on progress of investigations in 1915.** 279 and x pp.; maps, diagrs., index. *U. S. Geol. Survey Bull. 642.* Washington, D. C., 1916.

CAPPS, S. R. **A game country without rival in America: The proposed Mount McKinley National Park.** Map, diagr., ills. *Natl. Geogr. Mag.*, Vol. 31, 1917, No. 1, pp. 69-84. [An informing description of the scenery and wild life in this proposed Alaskan national park.]

CAPPS, S. R. **The Chisana-White River district, Alaska.** 130 pp.; maps, diagrs., ills., index. *U. S. Geol. Survey Bull. 650.* Washington, D. C., 1916. [From a geographic viewpoint this report on a region adjoining the Alaska-Yukon boundary line east of Mt. Wrangell is interesting chiefly on account of a section on the influence of rock types on topography and also for a section on vegetation. The latter is accompanied by a useful map showing the distribution of timber, chiefly in belts along the valley floors.]

CLAXTON, P. P. **Alaskan conditions.** *Rept. of the 33rd Ann. Lake Mohonk Conference on the Indian and Other Dependent Peoples, Oct. 20, 21, and 22, 1915*, pp. 76-81.

COLBERT, L. O., AND J. A. DANIELS. **Wire-drag work in Alaska.** 31 pp.; maps, diagrs., ills. *U. S. Coast and Geodetic Survey Special Publ. No. 34.* Washington, D. C., 1916. [Deals with the new method of detecting submerged rocks and other inconspicuous dangers to navigation which escape discovery by the usual methods of surveying.]

CRANE, W. R. **Transportation problems in Alaska.** Ills. *Official Proc. Richmond Railroad Club*, Vol. 15, 1916, No. 3, pp. 4-29 (discussion, pp. 26-29).

CUNNINGHAM, AUSTIN. **Brave deeds of our Arctic Signal Corps.** Ills. *Red Cross Mag.*, Vol. 12, 1917, No. 3, pp. 90-97. [Alaska.]

EAKIN, H. M. **The Quaternary history of central Alaska.** *Journ. Washington Acad. of Sci.*, Vol. 7, 1917, No. 3, p. 81. [Abstract of paper read at the meeting of the Geological Society of Washington, Nov. 22, 1916.]

ELLIS, CARLYLE. **Some American glaciers: Alaska and the northwest coast furnish varied specimens.** Ills. *Scientific American Suppl.*, No. 2104, Vol. 81, 1916, Apr. 29, pp. 280-281. [Including the Valdez Glacier that has figured largely in human geography because of providing a route for the Klondike trail of 1898.]

EMMONS, G. T. **The whale house of the Chilkat.** Diagr., ills. *Amer. Museum Journ.*, Vol. 16, 1916, No. 7, pp. 451-464.

CANADA

Ontario, Quebec

CUMBERLAND, BARLOW. **A century of sail and steam on the Niagara River.** xvi and 198 pp.; diagrs., ills., index. The Musson Book Company, Ltd., Toronto, 1913. $1.50. 9½ x 6½.

Of interest to those who dwell or travel along the Niagara River or who have had some share in the development of its traffic. Apart from a few historical references, the book is almost entirely a record of the successive eras of travel on the river; first, a story of canoes and sailing craft, then an era of steam, this in turn followed by a period of decadence of river traffic when rail transportation offered a strenuous competition, and finally the inauguration of a new period of activity and success under the Niagara Navigation Company. It is a history of boats more than of trade as is clearly shown in the chapter, "On the Upper Lakes with the Wolseley Expedition and Lord Dufferin," which details a stage in the career of the steamer *Chicora* rather than diplomatic or expeditionary triumphs.

The book meets the intentions of the promoters but it will be a disappointment to any who from the title infer that it is a comprehensive history of shipping on this important stream connecting two of the Great Lakes. ROBERT M. BROWN

AMY, LACEY. **Labrador, home of the iceberg.** Ills. *Travel*, Vol. 27, 1916, No. 1, pp. 24-27 and 52-53. [Description of the fishermen and villages of the coast. The population shrinks from 30,000 in a good cod summer to 2,000 resident fishermen in winter.]

DAWSON, W. B. **Tide tables for the eastern coasts of Canada for the year 1917, including the River and Gulf of St. Lawrence, the Atlantic coast, the Bay of Fundy, Northumberland and Cabot Straits; and information on currents.** 63 pp. Tidal and Current Survey, Dept. of Naval Service of the Dominion of Canada, Ottawa, 1916.

GRENFELL, W. T. **The year's work in Labrador.** *Journ. Natl. Inst. of Social Sci.*, Vol. 1, 1915, No. 1, pp. 106-113. New York.

HAWKES, E. W. **The Labrador Eskimo.** x and 235 pp.; map, diagrs., ills., bibliogr. *Geol. Survey of Canada Memoir 91: Anthropol. Ser. No. 14.* Ottawa, 1916.

LEVASSEUR, N. **La construction des navires à Québec: Précis historique.** *Bull. Soc. de Géogr. de Québec,* Vol. 11, 1917, No. 4, pp. 187-201.

MAGNAN, HORMISDAS. **Les réserves de colonisation.** *Bull. Soc. de Géogr. de Québec,* Vol. 10, 1916, No. 3, pp. 136-143. [Notes on the wise policy initiated in Quebec Province in 1902.]

—— **Quebec, Province of: Statistical Year-Book, 3rd year.** xii and 609 pp.; map, diagr., index. Bureau of Statistics, Quebec, 1916.

REINECKE, L. **Road material surveys in Ontario and Quebec.** *Summary Rept. Geol. Survey of Canada for 1915,* pp. 147-155. Ottawa, 1916.

ROUILLARD, E. **Les iles de la province de Québec.** *Bull. Soc. de Géogr. de Québec,* Vol. 10, 1916, No. 1, pp. 23-33; No. 2, pp. 105-115. [A gazetteer of the more important and interesting islands of Quebec Province: Part I, A-J; Part II, K-V.]

SIMARD, H. **La Côte-Nord: Esquisse de la région et des moeurs de ses habitants.** *Bull. Soc. de Géogr. de Québec,* Vol. 11, 1917, No. 4, pp. 203-216. [The north shore of the Gulf of St. Lawrence.]

SULTE, BENJAMIN. **Le petit-poisson.** *Bull. Soc. de Géogr. de Québec,* Vol. 10, 1916, No. 2, pp. 67-73. [The fish so designated by the populace of Three Rivers is a small codlike species known to the French-Canadian in general as "petite-morue," to the English-speaking section as "tommy cod." Amongst the immigrant fishes of the Canadian seas it is the one that penetrates farthest into the interior waters. It arrives at Three Rivers on Christmas Eve and for 15 days is harvested through the ice.]

UNITED STATES

General

DAY, P. C. **Relative humidities and vapor pressures over the United States, including a discussion of data from recording hair hygrometers.** 61 pp.; maps, diagrs. *Monthly Weather Rev. Suppl. No. 6.* U. S. Dept. of Agriculture, Washington, D. C., 1917.

It is an encouraging sign of the rising standard of the work of the Weather Bureau that more and more attention is being paid to the careful, accurate, and thoroughly scientific summarizing, charting, and discussion of many of the essential elements and phenomena of our climate. Well-merited criticism has, for many years, been directed against much of our meteorological work by our foreign colleagues, because we published and charted data without adequate attention to their accuracy, without using homogeneous series, and without reducing the data employed to the same period of time. All this has rapidly changed. Within a few months there have been several important studies, published in the *Monthly Weather Review* or in the *Supplement to the Monthly Weather Review,* which have stood the test of criticism and have added greatly to our knowledge of the meteorology and climatology of the United States.

The investigation of relative humidity and vapor pressure now before us covers its field well. The most important humidity observations made by the Weather Bureau are those at 8 A. M. and 8 P. M., Eastern Standard Time, and cover the period since July, 1888. These data, for the period January, 1889, through December, 1913, for nearly 200 stations, are tabulated in full. The values are also charted for the months of January, April, July, and October (Charts 1-8). The 8 A. M. and 8 P. M. observations do not give the daily means. Corrections for reducing the mean values at those hours to the true daily mean are given (Table 5). The daily march of relative humidity and the variations from hour to hour are, of course, not indicated by the data for 8 A. M. and 8 P. M. During a period of about five years, however (1881-1886), five observations of relative humidity were made daily at the then regular stations of the Signal Service (7 and 11 A. M.; 3, 7, and 11 P. M., Washington time). The mean values for these observations are tabulated (Table 2) and are graphically shown for 3 and 11 P. M. for the mid-winter, mid-spring, mid-summer, and mid-autumn months (Charts 9-16). In 1876-1880 another series of observations was made at 2 P. M., local time. These values are tabulated (Table 3) and are also charted for each of the mid-season months (Charts 17-20). The data for these different series of observations are, obviously, not strictly comparable. The daily march of relative humidity, vapor pressure, and temperature, and also the vapor pressure at saturation, compiled at the even hours from the records of self-recording instruments, are shown for six selected stations (Figs. 4 and 5). The average daily minimum relative humidities for the regular observing stations of the Bureau for April, July, and October have been computed (Table 7) and charted (Charts 21-23). The mean maximum temperature and the corresponding computed depression of the wet-bulb

thermometer are also given (Table 7) and charted (Charts 24-26). The depression of the wet-bulb thermometer is important as giving some indication of one's physical comfort or discomfort at high temperatures.

Among the other matters included in Mr. Day's report may be mentioned, as of special interest, the curves of annual march of relative humidity (8 A. M. and 8 P. M.) for selected stations (Figs. 1-3). Absolute humidity also receives its share of attention, in tables, figures, and charts.

Mr. Day's monograph deserves careful study on the part of all those who are concerned with matters in which atmospheric humidity plays a part. Many interesting points might be referred to here, if space were available. To note only one of these, which we do not recall to have seen emphasized before: In the cases of both Mt. Washington and Pike's Peak (Table 2) the percentages of relative humidity are continuously high, with small monthly and diurnal variations. On the lee side of these mountains, even at high elevations, the humidities are comparatively low, the obvious result of loss of moisture in the air in passing over the mountains and of the decrease in humidity due to adiabatic warming of the air descending on the leeward side.

As a matter of general interest we wish that a bibliography of the earlier humidity charts and their discussion had been included. R. DEC. WARD

—— **Intracoastal waterway, Boston, Mass., to Beaufort, N. C.: Final report on sections from New York Bay to Delaware River and from Delaware River to Chesapeake Bay.** 16 pp. *House of Repr. Doc. 196, 63rd Congr., 1st Sess.*, Washington, D. C., 1913.

It is advised that the Chesapeake and Delaware Canal be purchased and enlarged to a sea-level canal of 12 feet depth and 90 feet bottom width with the least interference practicable to present traffic, at a cost including the first year's maintenance of $8,000,000. Further deepening to 25 feet should await observation of the commerce of the improved waterway, and, if adopted, should depend on co-operation by the local states.

Regarding the waterway from the Delaware River to New York Bay, a lock canal, costing $20,000,000, of 12 feet depth and 90 feet bottom width, built at public expense, is recommended, provided that the state of New Jersey secure and donate to the United States Government all rights of way necessary for a 125-foot bottom width, 25-foot depth, sea-level canal along the same route.

It is somewhat singular that the report of "The Special Board of Engineers," dated 1912, is printed after the final report of 1913 and contains a suggestion which is ignored in the final report to the effect that the 12-foot canal from New York Bay to the Delaware River would be of little use, and that enlargement of such a canal after construction would entail great expense. The Special Board therefore recommended the original plan of 125 feet bottom width and 25 feet depth, and in the Delaware River-Chesapeake Bay section a 12-foot sea-level canal, to be later deepened to 25 feet. R. H. JONES

MARVIN, GEORGE. **The Great River: The war on the Mississippi; Controlling the Mississippi; The sovereignty of the Mississippi; Navigating the Mississippi.** Maps, diagrs., ills. *World's Work*, Vol. 30, 1915, No. 1, pp. 49-65; No. 2, pp. 213-237; No. 4, pp. 469-485; No. 5, pp. 584-604.

The Mississippi River problem is not a local problem but a national one, and while control of the river vitally concerns a large number of communities bordering the stream, a regulated Mississippi would benefit the people far beyond the boundaries of the riparian states. Mr. Marvin's articles are, then, in the line of public education and deserve the careful consideration of the people in all sections of the country. The free use of illustrations makes the arguments compelling, while the broad discussion of the divers schemes and policies of controls yields an adequate background to his plea for a settled policy. The writer carries the figure of an invading army throughout his discussion with considerable success; but at times it is overdone, as when a picture of the flooded Main Street in Dayton, Ohio, is entitled "Louvain," and the map of the flooded area of the river is called "The periodical Belgium of the Mississippi." Among the "troubles" to which the great river is subjected, Mr. Marvin mentions the Mississippi River Commission and the Mississippi River Levee Association. These, in his opinion, defeat the solution of the river problem, because the members are not actually "on the job" as in the case of the Ohio River Board and also because they are tied up to "special pieces of legislation." On the whole, the treatment, although popular in style, is fairly conceived and soundly conducted. Everyone must regret the lack of unanimity of mind and action concerning the river improvements, but, until the problem is faced squarely as a national issue, partisan legislators and local promoters will continue to exact appropriations for temporary needs. ROBERT M. BROWN

—— **River regulation, flood control, and water conservation and utilization.** 430 pp. Hearings before the Committee on Commerce, U. S. Senate, 64th Congress, 2nd Session, on H. R. 14777 and S. 5736. Washington, D. C., 1917.

In brief this publication covers the hearings and reports on the Flood Control Act and the Newlands Bill. As a result of all the reports on waterways which the Government has issued in recent years one might expect that some tentative plan would be evolved, but one Congress after another delays adequate action, and conditions are as unsatisfactory as ever. The public is treated almost yearly to a rather disgraceful discussion of the River and Harbor Appropriation Bill; the result of this in Congress has been to cut down the amount of the appropriation, and the people at large are being convinced that appropriation bills mean unfair if not dishonest legislation and that waterway bills are particularly to be distrusted. To offset the diminishing appropriation of the River and Harbor Bills, specific bills and acts are introduced by special boards into each Congress and the appropriations of such of these as pass, added to the current rivers and harbors bill appropriation, must be considered the total appropriation. One of the subsidiary bills of the 64th Congress was the so-called Flood Control Bill (*House of Repr. Bill No. 14777, 64th Congr., 2nd Sess.*). This act provided for the control of the floods of the Mississippi and Sacramento Rivers notwithstanding the fact that the River and Harbor Bill of the same Congress allotted a sum to the Mississippi River Commission for flood control, among other things, and also provided some money for the Sacramento River. The reason for this is not altogether clear, but some light is thrown upon the situation by J. Hampton Moore in his speech before the Atlantic Deeper Waterways Association in 1916. "In other words," said Mr. Moore, "the advocates of flood control started out to go it alone and then 'came back to father,' awaiting their opportunity to leave 'father' next year if they can obtain the larger and independent appropriation from Congress."

A serious situation confronts the people because of the number of waterways associations which are clamoring for appropriations for their special hobby. This has led to the so-called Newlands Bill (*Senate Bill No. 5736, 64th Congr., 2nd Sess.*) which provides for all phases of our waterway needs. For instance, the act creating the Mississippi River Commission permits of no use of the appropriation to that Commission for water as a natural resource; a flood control bill may be inimical to the improvement of a river for a highway, for reclamation, or for a number of other uses. The Report of the Inland Waterways Commission (*Senate Doc. No. 325, 60th Congr., 1st Sess.*), published ten years ago, recommended the appointment of a general water-control board. The need of a national committee free from sectional interests and protected from associations riding a hobby to handle our waterway problem is stronger today than it was ten years ago. It is difficult to understand how Congressional committees can be exposed to such a report as this one and not catch something that would result in a slightly better act of Congress for waterways. It may be that this report has been put into the present form so as to hide as much information as possible. If one is diligent, however, especially when the appendixes are reached, a good idea of the need of this country in the way of water control may be obtained from this collection of hearings.

ROBERT M. BROWN

SCHOFF, W. H., edit. **Ninth Annual Convention of the Atlantic Deeper Waterways Association, held at Philadelphia, Pennsylvania, September 12, 13, 14, 15, 1916, . . : Report of the proceedings.** 298 pp.; maps, ills., index. Atlantic Deeper Waterways Assoc., Philadelphia, 1917.

The significant features of this report are the annual address of the president, J. Hampton Moore, and the paper on "Some Problems of Inland Waterway Transportation," by General W. M. Black. Mr. Moore offers a report of progress on the Atlantic Intracoastal Waterway. It is stated here that the intracoastal waterway from New York to Jacksonville, Florida, requires now for its completion only 131 miles of digging and partial digging, estimated to cost about $47,800,000. This project has two worthy purposes: one to facilitate coastwise traffic in general, a need which is especially imperative between Chesapeake Bay, Delaware Bay, and New York harbor; the other to provide in times of war for the coast movements of commodities and naval and army supplies in case off-shore traffic is impossible.

General Black offered, in his address, considerable trenchant advice concerning waterways which he based on actual experience. He deplored the slipshod and halfway measures which have been adopted by many of our inland waterway boards and suggested lines of procedure whereby the intracoastal waterway may be able to compete with ocean and rail carriers. His arguments, teeming with examples, make it clear that while waterways of navigable depth have long existed only those have been successful where

the overhead charges on the plant have been kept low, the operating expenses minimized, and the influence of time in the movement of freight fully appreciated.

Both speakers, notwithstanding their zeal for waterways, retained a commendable attitude towards railway competition and were not inclined to use the railroad managers as scapegoats for their own failures. ROBERT M. BROWN

—— **Waterway to connect waters of Chesapeake and Delaware Bays: Report of the commission appointed by the President to examine and report upon a route for the construction of a free and open waterway to connect the waters of the Chesapeake and Delaware Bays.** 74 pp.; map, diagr. *Senate Doc. No. 215, 59th Congr., 2nd Sess.*, Washington, D. C., 1907.

Two routes are considered, the present Delaware and Chesapeake Canal and the Sassafras route. The commercial and military advantages of the two are about the same, but the first is preferred on account of greater cheapness. Its present value is estimated at $2,514,290. A tide-level canal with a minimum full-depth width of 150 feet and mean low water depth of 35 feet with no locks is advocated. Jetties are to be built at the Delaware end to protect the channel from being obliterated by tidal flow. Bridges are to be high with draw spans. Annual dredging will be required. The total cost of such a waterway on this route is estimated at $20,621,324, with an annual expenditure for maintenance of $149,620. The commission reports that they found the business organizations and leading citizens of Baltimore, Wilmington, and Philadelphia practically unanimous in their demand for such a canal. While the chief use of the canal is expected to be in the transportation of coal and lumber, it is pointed out also that it would relieve the coastwise traffic of a dangerous sea route, saving both time and expense to the trade movements of the whole country.

It is proposed to have either end of the canal protected by sufficient coast defenses to render its passage at all times open. The Civil War is cited to show the value of the canal for the transportation of troops and supplies. On April 17, 1861, Virginia seceded from the Union and started her troops north to Washington. Two days later every bridge on the Philadelphia, Baltimore, and Washington Railroad was burned from Baltimore to the Susquehanna River, severing all rail connections along the seaboard to Washington. Then the Government seized all the propeller steamers in Philadelphia that could pass through the Chesapeake and Delaware Canal and used them for conveying troops and supplies to Washington. Throughout the war the canal played a most useful part in supplying the Army of the Potomac in the field. R. H. JONES

MOORE, J. H. **Canals for defense.** Speeches in the House of Representatives, June 13, 1916. 20 pp. Washington, D. C. [Reprint from *Congressional Record.*]

MORLEW, JOHN. **New boats on an old river.** Ill. *Commercial America*, Vol. 13, 1916-17, No. 7, pp. 17 and 19. ["The inauguration of a service of power barges of many novel features marks the beginning of new era in the transportation history of the Mississippi."]

PARKER, WALTER. **Transportation problems of the Mississippi Valley.** *Commerce Repts.*, 1917, No. 164, pp. 188-189. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

REED, W. G. **The probable growing season.** Diagr. *Monthly Weather Rev.*, Vol. 44, 1916, No. 9, pp. 509-512. [For an article on a related topic, see "Weather as a Business Risk in Farming," by W. G. Reed and H. R. Tolley, in the July, 1916, *Review*, Vol. 2, pp. 48-53.]

SCHOFF, W. H. **The Mississippi River improvement.** 44 pp.; maps, diagrs., ills. Reprinted from *Commercial America*, Vol. 12, 1915-16, Nos. 4-6.

SMITH, E. H. **New York-Chicago aerial mail lines.** Maps, ills. *Flying*, Vol. 5, 1917, No. 12, pp. 504-506. [Abstracted in the March, 1917, *Review*, Vol. 3, p. 241.]

—— **Southern states, Public road mileage and revenues in the, 1914: A compilation showing mileage of improved and unimproved roads, sources and amounts of road revenues, bonds issued and outstanding, and a description of the systems of road administration, fiscal management and other factors affecting road improvement in each state.** 52 and lxxi pp.; diagrs. *U. S. Dept. of Agric. Bull. No. 387.* Washington, D. C., 1917.

—— **U. S. Geographic Board, Decisions of the.** 3 pp. Nov. 1 and Dec. 6, 1916. U. S. Geographic Board, Washington, D. C.

WARD, R. DEC. **The prevailing winds of the United States.** Maps, bibliogr. *Annals Assoc. Amer. Geogrs.*, Vol. 6, 1916, pp. 99-119.

WELLS, W. C. **The metric standard.** *Bull. Pan American Union*, Vol. 44, 1917, No. 1, pp. 22-28.

GANNETT, HENRY. ***Contour map of the United States.*** 1:7,000,000. U. S. Geological Survey, Washington, 1916. [The newest edition of the Survey's standard small contour map of the United States.]

—— ***United States, National forests of the.*** [1:12,600,000.] Forest Service, U. S. Dept. of Agriculture, Washington, D. C., 1917.

North-Central States

—— **St. Paul, city of, Annual report of the Commissioner of Public Works for the year ending December 31, 1916.** 160 pp.; maps, index. Dept. of Public Works, St. Paul.

SCOTT, WILL. **Report on the lakes of the Tippecanoe basin (Indiana).** 39 pp.; maps, diagrs. *Indiana University Study No. 31* (= Vol. 3, 1916, July).

SMITH, J. W. **Agricultural meteorology.** Diagrs., bibliogr. *Proc. Ohio Acad. Sci.*, Vol. 6, 1915, Part V, pp. 239-264. [Abstracted in the October, 1917, *Review*, Vol. 4, p. 317. Deals mainly with the Middle West.]

VAN CLEEF, EUGENE. **Duluth, a product of the waterways.** Map. *Journ. of Geogr.*, Vol. 15, 1916-17, No. 6, pp. 189-191.

VOGT, P. L. **Village growth and decline in Ohio.** Map. From *The American City*, Vol. 13, 1915, No. 6, pp. 481-485.

WINCHESTER, D. E., C. J. HARES, E. R. LLOYD, AND E. M. PARKS. **The lignite field of northwestern South Dakota.** 169 pp.; maps, diagrs., ills., bibliogr., index. *U. S. Geol. Survey Bull. 627.* Washington, D. C., 1916. [Accompanied by geologic maps of Harding and Perkins Counties, each 1:125,000.]

YOUNG, L. E. **Surface subsidence in Illinois resulting from coal mining.** 112 pp.; maps, diagrs., ills., index. *Illinois State Geol. Survey Bull. 17.* Urbana, 1916.

ZIEGLER, VICTOR. **The potash deposits of the sand hills region of northwestern Nebraska.** Maps, diagrs., ills. *Colorado School of Mines Quart.*, Vol. 10, 1915, No. 3, pp. 6-26. [Abstracted in the January, 1917, *Review*, Vol. 3, p. 67.]

—— [***Topographic map of the United States.***] Five sheets, 1:62,500: ***Kimmswick*** (***Mo.-Ill.***); ***Mechanicsburg, Milford Center, Morrow*** (***Ohio***); ***Three Rivers*** (***Mich.-Ind.***) U. S. Geol. Survey, Washington, D. C., 1916.

South-Central States

HARPER, R. M. **Economic botany of Alabama. Part 1: Geographical Report, including descriptions of the natural divisions of the state, their forests and forest industries, with quantitative analyses and statistical tables.** 228 pp.; map, ills., bibliogr., index. *Geol. Survey of Alabama Monograph 8.* University, Ala., 1913.

Although bearing date of 1913 and already previously listed (*Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, p. 626) this work deserves notice because of its method, a method commented upon in the review of the same author's "Geography and Vegetation of Northern Florida" (March, 1917, *Review*, Vol. 3, pp. 409-410). The state of Alabama is divided into fifteen main forest regions. So close is the correlation between geology, topography, and soils, on the one hand, and vegetation on the other, that the forest map of the state which accompanies the report scarcely differs in the demarcation of the various geographical regions from a geological map of the same size. In discussing the various divisions, much the same scheme is followed as in the report on Florida, except that here, in treating the vegetation, attention is restricted to the forests. GEORGE E. NICHOLS

HALL, B. M., AND M. R. HALL. **Second report on the water powers of Alabama.** 448 pp.; maps, diagrs., ills., index. *Geol. Survey of Alabama Bull. No. 17.* University, Ala., 1916.

LOEB, E. M. **The assessing of scientific port charges and basis of method of such charges.** *Proc. and Papers of the Fourth Ann. Convention of the Amer. Assoc. of Port Authorities, Held at Los Angeles, Cal., Sept. 13-15, 1915*, pp. 173-184. New York, n. d. [Relative to the port of New Orleans.]

PETERS, M. E. **Texas trails.** *Proc. Mississippi Valley Hist. Assoc. for the Year 1913-14*, Vol. 7, pp. 55-66. Torch Press, Cedar Rapids, Ia., 1914.

SMITH, H. W. **River-stage forecasts for the Arkansas River, Dardanelle to Pine Bluff, Ark.** Map, diagrs. *Monthly Weather Rev.*, Vol. 44, 1916, No. 3, pp. 143-150.

STEPHENSON, L. W., AND A. F. CRIDER. **Geology and ground waters of northeastern Arkansas.** With a discussion of the chemical character of the waters by R. B. Dole. 315 pp.; maps, diagrs., ills., bibliogr., index. *U. S. Geol. Survey Water-Supply Paper 399.* Washington, D. C., 1916. [With two pages on the physiographic provinces of Arkansas, a section on physiography, and a geological map of the northeastern part of the state prepared by the authors under the direction of T. Wayland Vaughan, based in the extreme southwest on A. C. Veatch's map, Pl. III, *U. S. Geol. Survey Professional Paper 46*, 1906.]

WIGHT, F. C. **Five days on the Mississippi.** Map, diagrs., ills. *Engineering News*, Vol. 76, 1916, No. 24, pp. 1114-1119. [River below Memphis.]

MEXICO AND CENTRAL AMERICA

BLAKESLEE, G. H. **The results of the Panama Canal on world trade. I: North America. II: South America and the Far East.** *Outlook*, Vol. 3, 1915, No. 9, pp. 490-497; No. 13, pp. 717-722. New York.

The period under consideration is the first year of operation—a period which coincides with the first year of the European War. On the whole, the tonnage using the canal showed disappointing results. This was due not so much to the small trade of the United States using the canal, for it was reasonably heavy; the great shortage from what had been predicted was due, in large part, to a marked lack of European mercantile tonnage on the high seas. During the first year of operation, the canal handled, in the trade between the United States and South America, about 300,000 registered tons of shipping more than had been predicted in the official estimates. In the trade with the Far East, our ships had almost a complete monopoly. The European War has entirely upset all calculations as to canal traffic. The writer thinks, however, that when the great war is over and the world's trade and industries have adjusted themselves to the Panama route, the official estimates of traffic and tolls will be surpassed. AVARD L. BISHOP

GOETHALS, G. W. **Government of the Canal Zone.** 106 pp., ills., index. (The Stafford Little Lectures for 1915.) Princeton University Press, Princeton, 1915. $1.00. 8 x 5½.

The author treats of the difficulties encountered by the United States in selecting a suitable government for the Canal Zone. Delicate political relations entered into the question, but many of the problems were geographical. Temperate-zone colonies established in the tropics demand a specialized form of government. Distance from the seat of authority requires that the local governor be vested with unusual powers. Since the population of the Canal Zone produces little in the way of foodstuffs and as the Isthmus is the meeting places of vessels from many distant lands, often in need of provisions, the government established must enter the economic field and handle large supplies of food and fuel. Problems of labor, city planning, and sanitation as well as the completion, control, and operation of the Canal depend upon the Zone authorities for solution. The form of government adopted by the Panama Canal Act, which went into effect on April 1, 1914, provides for this complex administration. A government by executive order was established. The President of the United States names the Governor, who discharges all the varied duties of the post. The Act authorizes the practical depopulation of the Canal Zone, and the entire strip of some 450 square miles, except about 3,000 acres kept clear for sanitation, is to be left in jungle. Hence the population of the Zone will remain small, and the principal duties of the Governor will be the operation and maintenance of the Canal. This gives a flexible, easily adapted system of control. In case of war the President designates an army officer who assumes complete charge, civil and military, of the Canal and Canal Zone.

AGRAMONTE, D. F. **La República de Guatemala en 1916.** *Rev. de Geogr. Colon. y Mercantil*, Vol. 14, 1917, No. 9, pp. 322-334. Real Soc. Geogr., Madrid. [Extract from *Memoria Comercial.*]

AVALOS, J. F. **México próspero: Su política financiera y su política agraria.** 42 pp. Mexican Embassy, Washington, D. C., 1915.

AYMÉ-MARTIN, H. **Le pétrole au Mexique.** *Bull. Soc. de Géogr. Comm. de Paris*, Vol. 38, 1916, No. 7-8-9, pp. 410-433.

BALAREZO, MANUEL. **Colonización de la Baja California.** *Bol. Oficial de la Secretaría de Fomento*, Vol. 2, 1917, No. 2, pp. 110-133. Mexico. [A colonization project based upon the agrarian system of New Zealand.]

BARRETT, JOHN. **Mexico: A review and a forecast.** Ills. *Bull. Pan American Union*, Vol. 44, 1917, No. 1, pp. 41-57. [Reprinted from the *Yale Review* for January, 1917.]

BARRON, C. W. **The Mexican problem.** With introduction by Talcott Williams. xxv and 136 pp.; map, ills. Houghton Mifflin Co., Boston and New York, 1917. $1.00. 7½ x 5. [The author maintains that the problem is political rather than economic.]

BIGOT, RAOUL. **Le Mexique moderne.** 272 pp.; ills. Pierre Roger & Cie, Paris, 1909. 4 fr. 8 x 5½. [Mexico's gradual return to stable conditions lends fresh interest to any conscientious observer's account of the country. In this book the author presents a picture of Mexicans at home and at work and supplies a general economic survey. He appears particularly interested in their customs and their industries, and his interest has been strong enough to provide attractive reading. The text, however, is weak in regional descriptions, of which it supplies almost none.]

—— **Canal Record: Vol. 9; August 25, 1915 to August 16, 1916.** Published weekly under the authority and supervision of the Panama Canal. 448 pp.; maps, diagrs., ills., index. Balboa Heights, Canal Zone, 1916. 12 x 9.

—— **Catálogos de los seismos registrados durante el año de 1912 en la Estación Seismológica Central, Tacubaya; en las estaciónes seismológicas de primer orden de Mérida, Yuc., y de Zacatecas y en las de segundo orden de Oaxaca y de Mazatlán. Catálogo de los macroseismos sentidos en la República Mexicana durante el año de 1912.** Map. *Parergones del Inst. Geol. de Mexico*, Vol. 5, 1914, No. 6-8, pp. 230-349.

—— **Centro-América, Monografía de las cinco repúblicas de.** 47 pp.; maps, ills. Publ. de la Oficina Internacional Centro-Americana. Sanchez & De Guise, Guatemala, 1915. 10 x 7.

—— **Chiapas, The state of.** Ills. *Mexican Rev.*, Vol. 2, 1917, No. 3, pp. 4-5. Washington, D. C.

—— **Costa Rica: General descriptive data.** 31 pp.; ills. Pan American Union, Washington, D. C., 1916.

—— **Costa Rica, República de: Anuario Estadístico, Vol. 19, Año 1915.** xlviii and 460 pp. San José, 1917.

ELLIOTT, L. E. **Guatemala: Land of yesterday and to-day.** Ills. *Pan-American Mag.*, Vol. 24, 1916, No. 2, pp. 64-84. [This number of the *Pan-American Magazine* is devoted to Guatemala. Besides the article listed above it includes others of economic interest on the republic.]

FLORES, TEODORO. **El petróleo Mejicano.** Diagrs., ills. *Bol. Soc. Nacional de Minería*, No. 227, Vol. 29, 1917, pp. 65-92. Santiago de Chile.

FONSECA, P. S. **Curso de geografía de El Salvador.** 159 pp.; map, diagrs., ills. Dutriz Hermanos, San Salvador, 1916. 7½ x 5½.

FONSECA, P. S. **Las relaciones comerciales de El Salvador y los Estados Unidos de América.** vii and 46 pp. [Publ. of] Second Pan-American Scientific Congress, Section 9, December, 1915. Washington, D. C.

FRANK, J. C. **American interoceanic canals: A list of references in the New York Public Library.** 90 pp.; index. Public Library, New York, 1916. [It is scarcely necessary to point out the usefulness of a publication of this type, specially valuable in this particular instance because of the widespread interest of the theme. The list is classified under the headings of bibliography, history, international relations and the four routes—Darien, Nicaragua, Panama, and Tehuantepec.]

GALLO, JOAQUIN. **Anuario del Observatorio Astronomico Nacional de Tacubaya para el año de 1917: Vol. 37.** 294 pp.; diagrs. Dir. de Estudios Geogr. y Climatol., Secretaría de Fomento, Mexico, 1916.

—— **Guatemala: General descriptive data.** 31 pp.; ills. Pan American Union, Washington, D. C., 1916.

SOUTH AMERICA

GENERAL

FRANCK, H. A. **Vagabonding down the Andes: Being the narrative of a journey, chiefly afoot, from Panama to Buenos Aires.** xxi and 612 pp.; map, ills. The Century Co., New York, 1917. $4.00. 9 x 6½.

A story of four years' tramping and observation among the mountain countries of

South America, by the author of "A Vagabond Journey Around the World," etc. The map opposite page 40 shows that Franck took the most direct routes from Bogotá to Quito, from Quito to Cuzco, from Cochabamba to Puerto Suárez. Yet he traveled almost entirely over ground unfamiliar to tourist, salesman, and scientist. After reading his account one can appreciate why travel routes in South America usually follow roundabout ways, why there has been no United States of South America, why political disunity is characteristic of those nations, why "unitary" republics are considered necessary, and why the local authority is often stronger than that of the central government. Mountain walls, bottomless gorges, bleak *páramos*, or unmapped wildernesses divide most of the centers of civilized life from one another. Even railroads overcome these obstacles but slowly.

Of the principal cities of South America one finds little account in this book. There are few facts concerning general commerce. The author devotes only limited space to history. The work is neither scientific nor literary. But it contains descriptions of landscape and human life that can be found in no other volume. There is a good deal of geography in it. The small towns of the Andean region are especially well portrayed. One who wants to know how the common people live in the secluded mountain districts, what they eat, how they dress, the character of their houses, their occupations, what are their products, and how those products are marketed, should read Franck's book. San Pablo (Colombia), where the making of Panama hats is a household industry, Azogues, the seat of a weekly hat fair, Cajamarca, where Pizarro found the Inca taking his yearly bath in November as the natives do today, Huaráz, "capital of the most populous department in Perú," Huancayo with its great Sunday market, and Biblián, a city of pilgrimage, are places whose life is pictured by few other writers. Of these out-of-the-way places, decayed and still decaying remnants of Inca enterprise, left stranded on the highlands when Lima on the coast replaced mountain-rimmed Cuzco as the capital city, the book affords a good description. This, of course, is not a true picture of South America. It is one-sided. There is more of culture, of genuine hospitality, of industry and business, even of morals and education in South America than the author records. The perfectly natural temper of a footsore pedestrian has its effect, too, on the traveler's vision. But as a rule, the author of this narrative retains his sense of humor sufficiently to give an accurate description of things as they are. The work is thus a record of an achievement notable in itself and is especially valuable for the reason that it will probably be years before another keen observer will visit these out-of-the-way places and write his impressions of them.

—— **América Latina, El comercio exterior de la, en 1915.** Diagrs. *Bol. Unión Panamericana*, Vol. 44, 1917, No. 1, pp. 32-40.

BARD, H. E. **South America: Brief outline of study suggestions with bibliography.** 68 pp. D. C. Heath & Co., Boston, New York, Chicago, 1916. 7½ x 5. [A study outline, primarily embracing historical and social interests, is followed by a bibliography of about 200 books.]

BURROUGHS, W. G. **Coal fields of South America.** Ill. *Colliery Engineer*, Vol. 35, 1915, No. 12, pp. 643-644; Vol. 36, 1916, No. 1, pp. 30-31, No. 2, pp. 72-73; No. 3, pp. 153-155.

CURRAN, H. M. **Los bosques de la America del Sur.** Ills. *Bol. Unión Panamericana*, Vol. 44, 1917, No. 3, pp. 287-302.

FARABEE, W. C. **The South American Indian in his relation to geographic environment.** *Proc. Amer. Philos. Soc.*, Vol. 56, 1917, No. 3, pp. 281-288. Philadelphia.

—— **Latin America, Special list of twenty-five books on. (Suitable for use as supplementary reading and reference books in high schools, normal schools, and colleges.)** *Hist. Teacher's Mag.*, Vol. 6, 1915, No. 3, pp. 86.

—— **Latin America in 1916.** *South American Journ.*, Vol. 82, 1917, No. 2, pp. 21-51. [Annual review number.]

—— **Puertos Sudamericanos de la costa oriental, El mejoramiento de los.** Ills. *Bol. Unión Panamericana*, Vol. 45, 1917, No. 4, pp. 421-441. [A brief description of harbor improvements made and planned as a result of the remarkable commercial development of the east coast of South America.]

REID, W. A. **Peruvian coast to Rio de Janeiro by rail.** Map, ills. *Bull. Pan American Union*, Vol. 44, 1917, No. 4, pp. 433-448.

REID, W. A. **South American port improvements—west coast, etc.** Map, ills. *Bull. Pan American Union*, Vol. 44, 1917, No. 2, pp. 141-165.

EUROPE

General

FAYLE, C. E. **The great settlement.** With a prefatory note by the Viscount Esher. xix and 309 pp.; maps, index. John Murray, London, 1915. 6s. 7½ x 5.

Europe teems with problems bequeathed by its past history and raised by the present war. Of these Mr. Fayle shows himself both an interested student and one having knowledge to impart to his readers. He has confined himself, however, to a presentation of these problems without attempting to show that the subtle influence of time and place makes them break out periodically into new forms and that when we discuss the problem of Constantinople we are merely taking up a modern phase of the problem of the straits which interested the politicians and traders of Hellas and Troy no less passionately than it does contemporary business leaders and diplomatists.

Historical continuity of this character is based largely on geography, and the historian can rarely advance a single step without tracing his course on a map. To have interpreted all the problems taken up by Mr. Fayle with the help of the map would have added interest to his discussions of the present situation in Europe as well as in the oversea or overland regions to which the continent is tied by links of trade and intercourse.

MARRIOTT, J. A. R. **The Eastern Question: An historical study in European diplomacy.** viii and 456 pp.; maps, index. Oxford University Press, Oxford, 1917. 12s. 6d. 9 x 6.

A systematic account of the Eastern Question, which contributes to the general enlightenment on a particularly thorny problem. The author has treated with especial thoroughness the modern phase of this ancient question. Above all, the book is an excellent retrospect of Near Eastern events familiar to living generations. The need for radical changes in the international handling of Turkish and related problems is one of the logical conclusions to which the reader comes after laying the book down.

Here and there traces of haste will be noted. To consider the facts of political geography of the Balkans as "especially obscure" is for the author to ignore the excellent work of some of his countrymen not to mention that published in other countries. The specialized work of Hogarth, Newbigin, and Woods, to mention only a few British writers, testifies to the guidance available. He would have been nearer the mark had he merely expressed disapprobation of lay laxity in appreciating the fundamental relation of geography to history. But this condition is one which is improving constantly—the war, in particular, having accelerated progress.

The few sketch maps scattered in the first part of the book deserve greater credit for the intention than the execution, although the author tells his reader that they "are intended to elucidate" the facts of political geography. His admirably written text deserves sound cartographical accompaniment and loses somewhat by the want of it.

The chief treaties are carefully summarized, but no mention is made of the so-called Adriatic Treaty of April 27, 1915, between the Entente Powers and Italy, reference to which was made in the *British Review* as early as September, 1915.

ASHLEY, R. L. **Early European civilization: A textbook for secondary schools.** xxi and 708 pp.; maps, diagrs., ills., index. The Macmillan Co., New York, 1916. 7½ x 5.

BELTRÁN Y RÓZPIDE, RICARDO. **La geografía del Noroeste de Europa según Cervantes.** *Rev. de Geogr. Colon. y Mercantil*, Vol. 13, 1916, No. 4, pp. 129-132. Real Soc. Geogr., Madrid. [Cervantes' last work "Trabajos de Persiles y Sigismunda" shows a careful study of the maps and geographies of the time.]

BLANCHARD, RAOUL. **The English fighting-ground in France and Flanders.** Maps. *Scribner's Mag.*, Vol. 62, 1917, No. 3, pp. 352-362.

BLINK, H. **Rassen, nationaliteiten, volken, en staten in Europa.** Map. *Vragen van den Dag*, Vol. 32, 1917, No. 3, pp. 236-249; No. 4, pp. 290-309; No. 5, pp. 337-363.

BONACCI, GIULIANO. **La seconda fase della grande guerra: Nel Medio Oriente attraverso il ponte balcanico.** Map. *Riv. Colon.*, Vol. 11, 1916, No. 1, pp. 17-34; No. 2, pp. 89-113.

BOSWELL, A. B. **The Polish question.** *Scientia*, No. 66, Vol. 22, 1917, pp. 294-302. Bologna.

BOSWELL, A. B. **The racial geography of east central Europe.** *Geogr. Teacher*, No. 46, Vol. 8, 1916, Part 6, pp. 351-360.

CAILLAUD, F. R. DU. **De l'identité des races qui ont formé les nationalités britannique et française.** Reprinted from *Man*, No. 79, 1915, Sept., pp. 1-5.

COLE, G. A. J. **The groundwork of east central Europe.** *Geogr. Teacher*, No. 46, Vol. 8, 1916, Part 6, pp. 340-350.

COLOMBI, EMILIO. **La concorrenza germanica ai porti latini.** *L'Esplorazione Commerc.*, Vol. 32, 1917, No. 4, pp. 102-106.

FRANKLIN, THOMAS, AND E. R. SHEARMUR. **Europe.** 44 pp.; maps. (Practical Geography Notebooks based upon the Atlas Geographies.) W. & A. K. Johnston, Ltd., London, [1916]. 4d. 10 x 7½.

GALLÉ, P. H. **Over het verband tusschen schommelingen in de sterkte van den Noordoostpassaat van den Atlantischen Oceaan en schommelingen in verschijnselen op hydrografisch en meteorologisch gebied in Europa.** Diagrs. *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 34, 1917, No. 1, pp. 38-53; No. 2, pp. 192-209.

GARGAS, SIGISMUND. **De sociale en economische toestand van het Koninkrijk Polen.** *Tijdschr. voor Econ. Geogr.*, Vol. 7, 1916, No. 7, pp. 376-385. The Hague.

GREGORY, J. W. **The mineral fields of the Franco-German borderlands.** Maps. *Scottish Geogr. Mag.*, Vol. 33, 1917, No. 8, pp. 358-363. [Review of Professor de Launay's "France-Allemagne—Problèmes Miniers-Munitions-Blocus-Après-guerre." The discussion is illustrated by figures from the reviewer's Presidential Address to the Geological Society of Glasgow, published in its *Transactions*, Vol. 16.]

GURNEY, A. E. **The population of the Polish commonwealth.** With a preface by Ludwik Janowski. 40 pp. Polish Information Committee, London, 1916. 6d. 8½ x 5½. [With a table giving the number of Poles in Poland as 20,000,000, with 3,000,000 in America and 1,000,000 in other countries.]

HAUSER, HENRI. **La guerre européenne et le problème colonial.** 111 pp. 3rd edit. Librairie Chapelot, Paris, 1915. 1 fr. 7 x 5½.

KEUNING, J. **Het oudste bericht over de westkust van Europa.** *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 33, 1916, No. 1, pp. 30-56.

KULAKOWSKI, B. D. **Poland as a concrete factor in international politics.** *Journ. of Race Devel.*, Vol. 8, 1917, No. 2, pp. 171-187.

LICHTENBERGER, HENRI AND ANDRÉ. **La guerre européenne et la question d'Alsace-Lorraine.** 132 pp. 4th edit. Librairie Chapelot, Paris, 1915. 1 fr. 7 x 5½.

MOLTKE, GRAF [H. K.] **Wanderbuch: Handschriftliche Aufzeichnungen aus dem Reisetagebuch.** 240 pp. Gebrüder Paetel Verlag, Berlin, 1913. Mk. 3. 8 x 5½. [Italy, Spain, France.]

MURATORE, DINO. **Corso pratico di geografia moderna per le scuole medie di 1° grado (tecniche-ginnasiali-complementari e commerciali). Vol. I: Geografia generale, L'Europa, L'Italia.** viii and 296 pp.; maps, diagrs., ills. **Vol. II: L'Europa in particolare.** xi and 336 pp.; maps, diagrs. Istituto Geografico de Agostini, Novara, [1914, 1915]. L. 1.80 each. 8½ x 6.

MUSONI, FRANCESCO. **Cause ed aspetti, specialmente geografici, dell' odierno conflitto europeo.** *Riv. Geogr. Italiana*, Vol. 24, 1917, No. 3-4, pp. 111-131.

FRANCE

JOINVILLE, PIERRE DE. **L'armateur Balguerie-Stuttenberg et son œuvre.** xxiii and 485 pp.; bibliogr., index. E. Champion, Paris, 1914. 10 x 6½.

A history of the economic changes in France from the pre-Revolutionary period to post-Napoleonic days is presented in this book under cover of the name of a Bordeaux trader and of his overseas undertakings. The work is important because it covers the transition period which preceded the era of intense industrial development in France.

The choice of Balguerie-Stuttenberg as a representative of the enterprising merchant class of his day was fortunate, to judge by the widely scattered activity of the man. Of more than passing interest are the details of his dealings with America, particularly with the West Indies. Later, with the decline of the West Indian trade, French traders turned to the United States, where a common feeling against the English added to the natural bond of sympathy between the two republics.

No better way of exhibiting the French overseas trade of a hundred years ago could have been devised than this painstaking and thorough study of a single man's activity. The student is given a glimpse of details which a generalized account cannot contain.

BLACHE, J. **Notes de morphologie glaciaire: Vallées d'Uriage et d'Allevard.** Diagr. *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, 1916, No. 3, pp. 285-295. Grenoble.

BLANCHARD, RAOUL. **Annecy: Esquisse de géographie urbaine.** Maps, ills., *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, 1916, No. 4, pp. 369-463. Grenoble.

[A study in city geography based on the method employed in the similar study on Grenoble (see *Geogr. Rev.*, Vol. 3, 1917, pp. 243-244). The rarity of urban development in the Alps confers peculiar interest on the examples that exist as a result of unusually favorable combinations of physical and historical circumstances. The interrelation of these two factors has created an especially edifying case in Annecy, "the pearl of the French Alps."]

BLANCHARD, RAOUL. **Le Haut Dauphiné à la fin du XVIIe siècle.** *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 3, 1915, No. 4, pp. 337-419. Grenoble.

BLANCHARD, RAOUL. **L'état actuel de l'industrie en Dauphiné (région de Grenoble).** *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, 1916, No. 3, pp. 329-354. Grenoble.

BLANCHARD, RAOUL. **Le verrou glaciaire de Grenoble.** Ills. *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, 1916, No. 2, pp. 237-257. Grenoble.

BLAYAC, J. **Contribution à l'étude du sol des landes de Gascogne.** Ills. *Ann. de Géogr.*, No. 133, Vol. 25, 1916, pp. 23-46.

BLIN, HENRI. **L'industrie résinière.** Ills. *La Nature*, No. 2229, 1916, June 17, pp. 385-389.

CLOUZOT, ÉTIENNE. **L'enneigement dans le Queyras aux XVIIe et XVIIIe siècles.** *La Géographie*, Vol. 31, 1916-17, No. 4, pp. 252-260. Paris. [Queyras is the upper valley of the Guil, a source of the Durance, in the Cottian Alps.]

COUSTET, ERNEST. **La nouvelle ligne ferrée de l'Estaque à Miramas (Marseille-Arles).** Ills. *La Nature*, No. 2211, 1916, Feb. 12, pp. 108-110. [See note in June, 1916, *Review* (Vol. 1, p. 459) on "Improvements in Internal Communication to the Port of Marseilles."]

COUSTET, ERNEST. **Le Rhône navigable et le tunnel du Rove.** Ills. *La Nature*, No. 2238, 1916, August 19, pp. 113-119.

COUSTET, ERNEST. **L'étang de Berre: Ses industries, son accès à la navigation maritime.** Maps, ills. *La Nature*, No. 2241, 1916, Sept. 9, pp. 161-166.

—— **Dauphiné, Guide industriel du: Étude sur les ressources économiques de la région dauphinoise et sur leur utilisation au point de vue industriel et commercial.** 39 pp.; map. Chambre de Commerce de Grenoble, 1916. [Indicative of the industrial expansion in the Dauphiné due to the war, mainly based on its water-power resources. A map shows the distribution of hydro-electric plants in 1916 classified according to the form of power which they generate.]

DELABORDE, PIERRE. **Notes de géographie alpine (Embrunais, Ubaye, Tinée).** *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 3, 1915, No. 4, pp. 421-424. Grenoble.

DUFRÉNOY, J. **La mise en valeur des terres éventées en France.** Ills. *Rev. gén. des Sci.*, Vol. 27, 1916, No. 15-16, pp. 472-478.

FLEURE, H. J. **France: A regional interpretation.** Maps. *Scottish Geogr. Mag.*, Vol. 32, 1916, No. 11, pp. 519-534. [Abstracted in the February, 1917, *Review*, Vol. 3, p. 150.]

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—— **Marocain en France, Les impressions de voyage d'un.** *L'Afrique Française*, Vol. 76, 1916, No. 7, pp. 260-266.

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PFAUNDLER, RICHARD VON. **Das deutsche Sprachgebiet in Südungarn.** Map, ills. *Deutsche Erde*, Vol. 13, 1914-15, No. 1, pp. 15-22; No. 2, pp. 56-60; No. 6, pp. 159-171; No. 7, pp. 185-197.

REVELLI, PAOLO. **Il Carso.** Map, ills. *Riv. Mensile del Touring Club Italiano*, Vol. 22, 1916, No. 11, pp. 602-610. Milan.

REVELLI, PAOLO. **L'Isonzo.** Ills. *Riv. Mensile del Touring Club Italiano*, Vol. 23, 1917, No. 2, pp. 62-70. Milan.

VINASSA DE REGNY, PAOLO. **Cenni toponomastici sull' alta Cárnia.** *La Geografia*, Vol. 4, 1916, No. 4-7, pp. 193-205. Novara.

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ASIA

Malay Archipelago, including the Philippines

Abendanon, E. C. **De geomorphologische beteekenis der basische stollingsgesteenten in het middendeel van den Ned.-Ind. Archipel.** Map. *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 33, 1916, No. 5, pp. 742-749.

Abendanon, E. C. **De oude beddingen der Beneden-Saädang-rivier.** Maps. *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 33, 1916, No. 3, pp. 429-449. [Celebes.]

Blink, H. **De opkomst en beteekenis van de rubber- en getah-pertja-productie en- handel in Nederlandsch Oost-Indië.** Map. *Tijdschr. voor Econ. Geogr.*, Vol. 7, 1916, No. 5, pp. 196-209.

Bordage, Edmond. **Le repeuplement végétal et animal des îles Krakatoa depuis l'éruption de 1883; Appendice: Repeuplement végétal de Taal.** *Ann. de Géogr.*, No. 133, Vol. 25, 1916, pp. 1-22.

Braak, C. **Drachen-, Freiballon- und Fesselballon-beobachtungen.** 58 pp.; diagrs. *Kon. Magnetisch en Meteorol. Observatorium te Batavia Verhandelingen No. 3.* Batavia, 1915.

Coronas, José. **General weather notes.** *Philippine Weather Bur. Monthly Bull.*, 1915, November, pp. 233-251, maps; December, pp. 261-279, maps; 1916, January, pp. 9-35, maps; May, pp. 107-123, map; June, pp. 135-145; July, pp. 153-164, map; August, pp. 173-186, map; September, pp. 195-209, maps. Manila, 1916, 1917. [The big typhoon that crossed central Luzon at the beginning of November, 1915, was characterized by the extraordinary rate of progress of nearly 24 miles per hour. The *Bulletin* for January, 1916, contains a report on the extraordinary floods occurring in Mindanao during that month.]

Coronas, José. **Two typhoons in five days over Luzon: The typhoon of Ambos Camarines, October 22 to 28, 1915, and the typhoon of Aparri, October 23 to 31, 1915.** 19 pp. **Two more typhoons in seven days over Luzon, November 3 and 10, 1915.** 9 pp. **The typhoon of southern Luzon, December 4 to 9, 1915.** 9 pp.; maps, diagrs., ills. Reprint from *Philippine Weather Bur. Monthly Bull.*, Manila, 1916.

Deuss, J. J. B. **De theecultur.** 104 pp.; map, diagrs., ills. (Series: Onze Koloniale Landbouw, No. 6.) 2nd edit. H. D. Tjeenk Willink & Zoon, Haarlem, 1915. Fl. 1.50. 9 x 6.

Edwards, C. W. **The live-stock industry of the Philippines.** Ills. *Philippine Agric. Rev.*, Vol. 9, 1916, No. 2, pp. 136-149.

Edwards, H. T. **The agricultural situation in the Philippine Islands.** *Philippine Agric. Rev.*, Vol. 9, 1916, No. 2, pp. 60-73.

Galán, Antonio. **The harmonic formula of Fourier and Bessel and its application to the study of the diurnal variation of the atmospheric pressure in Manila during the period 1890-1909.** Prepared under the direction of José Algué. 71 pp., diagrs. *Philippine Weather Bur. Monthly Bull.*, Manila, 1914.

Hall, H. U. **The Bagobo: Some notes on a lately acquired collection.** Ills. [*Univ. of Pennsylvania*] *Museum Journ.*, Vol. 7, 1916, No. 3, pp. 182-194. [The Bagobo are a settled people numbering some ten or twelve thousand and occupying a mountainous section of Mindanao. An ethnographical collection pertaining to these people has lately been acquired by the Museum.]

—— **[Philippine] Weather Bureau, Annual report of the. Part I: Work of the Bureau during the calendar year 1914. Part II: Hourly meteorological observations made at the Central Observatory of Manila during the Calendar Year 1914.** 140 pp. Manila, 1915.

WORLD AS A WHOLE AND LARGER PARTS

Brooks, Leonard. **The Americas** (New Regional Geographies, Book I). xiii and 235 pp.; maps, diagrs., ills., index. The Univ. of London Press, London, 1916. 3s. 8 x 5.

This first volume in a new series of regional geographies for secondary and high schools is somewhat of an advance over various others which have been published to serve a similar purpose, but it does not reach the ideal in all respects. The greater part of the book, 174 pages, is devoted to North America, with only some 55 pages devoted to South America. This perhaps is justified partly by the greater relative importance of the northern continent in general development and partly by the somewhat greater range of contrasts in North America than in South America. It nevertheless is true

that after reading the discussion of South America there is a feeling of incomplete treatment of some of the larger and more important aspects, such as the significance and development of the Argentine *pampa* and of the southern part of the Brazilian highland.

The general plan of treatment is to devote some preliminary pages to the larger aspects of the continent, such as the events leading up to the discovery, the major physical features, and the larger elements of climate. Following this general discussion, the detailed treatment is taken up by natural regions, as they are designated, although these differ in a good many ways from natural regions as outlined by other authors. Thus, in the United States, the Southern Appalachian region is made to include the coastal plain of the adjacent states; Florida is referred to as being a part of the Central Plain, and so on.

Under each one of these natural areas the larger factors are discussed, particularly with reference to physiography, important climatic conditions where there are such, routes of communication as affected by natural factors, and the development of prominent industries and cities. Rather more space is given to the discussion of city development than is characteristic of most books written on this side of the Atlantic.

There is, perhaps, rather more of geological and purely physiographic aspects to the text than is altogether consistent with a geography of two continents—such as, for instance, an explanation of the development of river valleys and the processes involved in the building of the major mountains. On the other hand, there is rather less of emphasis on the strictly economic-commercial-social aspects of human affairs than might be wished for. A good many, some seventy or more, black-and-white maps and diagrams and a few half-tone illustrations supplement the text in a very satisfactory way. Some of these at least might very profitably be used with much more advanced discussion than is apparently intended in connection with this book.

Taken all in all, the volume is a decidedly successful attempt to set forth in a simple and brief fashion some of the most important aspects of the two Americas and might perhaps, with considerable profit, be used in high-school courses in this country, especially where there is time for work to supplement the ground covered by the text.

W. S. TOWER

—— **Telephone and telegraph statistics of the world, January 1, 1914.** 6 pp. *Amer. Telephone and Telegraph Co. Bull. No. 4.* New York, 1915. [Abstracted in the August, 1917, *Review*, Vol. 4, pp. 148-149.]

WHYMAN, T. **The effect of geographical features on the war at sea.** *Journ. Manchester Geogr. Soc.*, Vol. 31, 1915, Pts. I-IV, pp. 19-22. [An address delivered to the Manchester Geographical Society on November 2, 1915.]

WILSON, RICHARD, edit. **Sons of the blood.** 64 pp.; maps, ills. (Dent's School Pamphlets, Senior, No. 3.) J. M. Dent & Sons, Ltd., London, Paris, and Toronto, [1916.]. 5½d. 7 x 5. [Economic geography of the British Empire, told in a simple and interesting way.]

WILSON, RICHARD, edit. **The staff of life.** 48 pp.; ills. (Dent's School Pamphlets, Intermediate, No. 3.) J. M. Dent & Sons, Ltd., London, Paris and Toronto, [1916]. 4½d. 7 x 5. [Geography of wheat in the countries from which Britain draws her supply.]

ZÁRATE, R. DE. **El comercio español en América.** *Rev. de Geogr. Colon. y Mercantil*, Vol. 13, 1916, No. 10, pp. 386-395. Real Soc. Geogr., Madrid.

—— ***Planisphère des fuseaux horaires dressé d'après les documents fournis par le Bureau des Longitudes.*** [Mercator's projection; equatorial scale, 1:72,000,000.] Service Hydrographique de la Marine, Paris, 1917.

—— ***World, The: An atlas, containing thirty-four coloured maps with a complete index.*** W. & A. K. Johnston, Ltd., Edinburgh, [1917†] 12 x 7½. [Old style of maps with political coloring. Relief in insufficient hachuring in black.]

PHYSICAL GEOGRAPHY

METEOROLOGY AND CLIMATOLOGY

MCADIE, ALEXANDER. **The principles of aërography.** xii and 318 pp.; maps, diagrs., ills., index. Rand, McNally & Co., Chicago and New York, 1917. $3.00. 8½ x 6.

This book is essentially a brief compilation of the most recent advances in meteorology. It is presented "... in a convenient form even if considerably condensed." Unfortunately, however, in condensing the author has sacrificed clearness. The arrangement of the chapters makes it difficult to grasp the book as a whole; and the extensive use of direct quotation has further weakened the unity. While such lack of systematic handling

of the material probably will be a serious obstacle to the use of the book as a textbook, still its value as a supplement to American textbooks in meteorology is assured by (1) the emphasis on recent developments, (2) the numerous quotations from important, widely scattered sources, and (3) the commendable, consistent use of metric units of measurement and weight and of the absolute scales of Centigrade temperature and atmospheric pressure.

For students, however, the employment of such terms as 'aërography', 'kilobar', 'hyperbar and infrabar' to the exclusion of the corresponding accepted ones, 'meteorology', 'millibar', and 'centers of action' cannot be other than confusing. As an example of what misunderstandings may arise from scattered arrangement and inadequate explanations, the discussion of the temperatures of the upper air may be cited. On page 18 we read: "The lowest temperature thus far recorded in any country was obtained in an ascension at Batavia, Java, December 4, 1913, when, at a height of 17,000 meters, the beginning of the stratosphere in equatorial regions, the temperature fell to 181° A. (—91.9° C.; or —133° F.). In this ascent the balloon reached a height of 26,040 meters, but above 17,000 meters the temperature rose steadily." On page 50: "In general, the existence of the stratosphere is explained as due to radiation, Gold finding that above the isobaric level of 250 kilobars radiation has a heating effect, and below this, a cooling effect. . . . The theory indicates that if convection were absent and the absorption of solar radiation did not increase with height, the normal state would be one in which the gradient of temperature diminished gradually to a very small value." On page 287: "10° A. Effective temperature of space. At an elevation of 80 kilometers (50 miles) the temperature ranges from 5° to 10° A.,"—a temperature lower than that of space! In many other places, too much is left for the reader to assume.

The advanced student will find that the book is lacking in footnotes and bibliography, but that the author offsets this with a wealth of tables computed only with difficulty and of illustrations and diagrams drawn from valuable, inaccessible sources. As a reference accompaniment to a well-ordered course in meteorology the book will probably be of greatest value.

C. F. BROOKS

CLARK, A. L. **Introduction to the study of cloud formations.** Ills. *Queen's Quart.*, Vol. 23, 1916, No. 3, pp. 248-260. Queen's University, Kingston, Ont.

DESLANDRES, H. **Influence des canonnades intenses et prolongées sur la chute de la pluie.** *Comptes Rendus Hebdomadaires des Séances de l'Acad. des Sci.*, Vol. 164, 1917, No. 17, pp. 613-615. Paris.

DOUGLAS, C. K. M. **On some causes of the formation of anticyclonic stratus as observed from aeroplanes.** Diagrs. *Proc. Royal Soc. of Edinburgh*, Vol. 37, 1916-17, Part II, pp. 137-148.

KASSATKIN, I. **Les mouvements verticaux de l'atmosphère.** 169 pp.; diagrs. Reprint from *Bull. Soc. Imp. des Naturalistes de Moscou*, 1914. [In Russian: summary in French.]

KEYES, C. R. **Competency of wind in land depletion.** *Monthly Weather Rev.*, Vol. 45, 1917, No. 2, pp. 57-58. [A paper along the line of the author's studies in the past three years and similar papers under related titles in other journals. He argues for the great relative effect of wind as an agent of erosion.]

KINCER, J. B. **Daytime and night-time precipitation and their economic significance.** Maps, diagrs. *Monthly Weather Rev.*, Vol. 44, 1916, No. 11, pp. 628-633. [Abstracted in the April, 1917, *Review*, Vol. 3, pp. 327-328.]

LULOFS, H. J. **Aristoteles en Seneca over atmospherischen neerslag (Bijdrage over de physische geographie der Ouden).** *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 34, 1917, No. 1, pp. 79-99; No. 2, pp. 239-256.

MCADIE, ALEXANDER. **Aviation and aerography.** Diagrs. *Scientific American Suppl.*, No. 2161, Vol. 83, 1917, June 2, pp. 341-342.

MCADIE, ALEXANDER. **Forecasting the seasons: A subject of great importance in connection with planting and growth of crops.** Diagrs. *Scientific American Suppl.*, No. 2169, Vol. 84, 1917, July 28, pp. 50-51.

MARVIN, C. F. **Elementary notes on least squares, the theory of statistics and correlation, for meteorology and agriculture.** Diagrs., bibliogr. *Monthly Weather Rev.*, Vol. 44, 1916, No. 10, pp. 551-569.

—— **Meteorology in war.** *Nature*, No. 2455, Vol. 98, 1916, Nov. 16, pp. 216-217.

REED, W. G. **Weather insurance.** *Monthly Weather Rev.*, Vol. 44, 1916, No. 10, pp. 575-580. [See the related article by the same author in the July, 1916, *Review*, and the note in the April, 1917, *Review*, p. 328.]